MECHANICAL HANDLING

INCORPORATING 'MATERIALS HANDLING'

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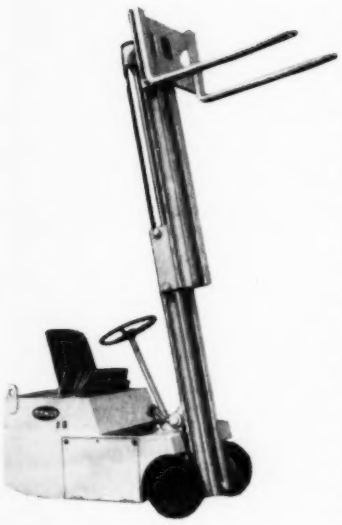


BRITAIN'S PROGRAMME FOR ROADS

WITH the announcement that a 70-mile length of the first major motorway ever to be constructed in Great Britain is to be opened to traffic next month, a good deal of attention has been focused recently on the gigantic programme which is now being carried out in the building and reconstruction of main roads. Said to be the most comprehensive scheme at present being carried out in Western Europe, it also received attention at the last British Association meeting at York, where the engineering section took transport and communications for its main discussion field.

The five major projects announced in 1956 by the Rt. Hon. Harold Watkinson, Minister of Transport and Civil Aviation, were: 1. An improved road from London to the North-East based on the Great North Road. 2. A new motorway from London to the North-West. 3. Improved roads to the Channel ports. 4. Better communications between the Midlands and South Wales. 5. A new road from London westwards to the Airport, the West of England and South Wales.

On the London-Birmingham motorway 49 miles are in dual, 36-ft-wide carriageways and 6 miles in dual, 24-ft-wide carriageways. The motorway crosses existing railways, rivers, canals, roads and ditches, all of which had to be bridged, either under or over the motorway, which necessitated the building of 132 major and minor bridges together with 90 large water culverts. When it is known that this gigantic undertaking has been completed within a total construction period of 19 months it is not difficult to appreciate to what a vast extent the contractors must have relied upon various forms of mechnical handling in order to complete the project according to schedule. At one period during construction we are told that the machinery employed developed 80,000 h.p. which worked out to be equivalent to 20 h.p. per man employed on the contract. Although this figure does not apply to mechanical handling equipment alone, it is worth while knowing that at the same period material was arriving at the site at the rate of 30,000 tons per day and among the many items supplied during the whole period of construction were 2,500,000 tons of ballast for concrete, 13,000 tons of steel for reinforcing the concrete and 400,000 tons of asphalt to surface the roadway, all of which at some time or another must have been mechanically handled.

The value of the plant used on the 53-mile southern portion of the London-Birmingham motorway amounted to some £5 million. Such plant covered all aspects of construction and maintenance from initial earthmoving to bridge, viaduct and tunnel construction, foundations and final surfacing and, to mention but a few examples must have involved such mechanical handling items as excavators and motor graders, bulldozers and shovels, cranes, hoists and other lifting devices for bridge and construction work, equipment for the removal of excavated material from tunnels and culverts, conveyors used in connection with screening plant and bulk cement and the various forms of mechanical handling associated with bitumen-laying trains and macadam spreaders used for final surfacing.

The first section of Britain's huge road-building programme is complete, but the greater part is still to be completed, most of it already being under way. Without mechanical handling aids none of it would be possible, and full justice should therefore be given to the industry which is contributing so much to the final result. An excellent example of how a member of just one section of the industry is preparing to meet ever-increasing demands is given by the description in this issue of a new tractor plant built by a company whose products are in use to a large extent in the construction of the new roads.

Pour les lecteurs de l'étranger
Für unsere ausländischen Leser
Para los lectores de ultramar

SUMMARY OF CONTENTS

For readers overseas

SOMMAIRE EN FRANÇAIS

Progrès récente dans la manutention des matériaux chez Hoover, Limited
Par P. C. MacCullock. Page 564
Description des méthodes et du matérial nouveaux mis en service ces dernières années afin d'améliorer et d'accroître la production. Cet article donne la description et des illustrations détaillées des changements survenus dans la section coulage en coquille, ébarbage et usinage.

La plus grosse malterie mécanique de l'Europe Page 571
C'est une nouvelle malterie entièrement installée et équipée de machines de marques anglaises, qui serait la plus grande usine du genre en Europe à fonctionner entièrement par des méthodes d'automation.

Un chariot élévateur à fourche électrique 3 tonnes Page 573
C'est une description détaillée avec un dessin en coupe d'un nouveau véhicule lourd construit par l'I.T.D., Ltd.

Nouveau tracteur industriel 'trois-en-enu', ou à 3 usages Page 581
Il s'agit du tracteur industriel 702 Massey-Ferguson, qui comporte un tracteur à pelle monté à une extrémité, et une pelle mécanique à l'autre, ces deux machines étant séparables et actionnées hydrauliquement.

La nouvelle usine de tracteurs de l'Ecosse Page 584
Description de la vaste et nouvelle usine de la Caterpillar Tractor Co., Ltd., que l'on vient d'inaugurer à Glasgow. On y produit acturellement le tracteur type D8 bien connu, dans un bâtiment d'une superficie couverte de 5,4 hectares.

Equipement de manutention dans une nouvelle usine d'amiante au Canada
Par John Indrod, B.A.(Com.) Page 594
Environ 4,8 kilomètres de courroies de transport et 8 kilomètres de tuyauteries d'aspiration et de goulottes de descente ont été installés dans une nouvelle fabrique d'amiante appartenant à la Lake Asbestos of Quebec, Ltd.

Manutention avec les chariots industriels
Par L. F. Hoefkens Page 596
1ère Partie d'une nouvelle série d'articles qui fourniront de nombreux renseignements sur la question des chariots industriels.

Smiths annonce une nouvelle grue camion de 22½ tonnes Page 605
C'est la description de la plus récente machine venant s'ajouter à la série des grues montées sur camion construites par la firme Thomas Smith & Sons (Rodney), Ltd. La capacité de levage maximum de cette grue suivant les normes britanniques est de 22.680 kg à rayon de 3 mètres, quand elle fonctionne avec la flèche de base de 9,1 mètres.

Le Système Dempster Dumpster Page 606
C'est un système de manutention de containers que l'on a beaucoup employé aux U.S.A. et que l'on va maintenant construire sous licence dans le Royaume-Uni.

Une rampe transporteuse pour élever les charges á transporter par brouettes ou chariots á bras page 610
Par H. G. Vallings, A.M.I.Mech.E.
Lorsque des matériaux doivent être habituellement déplacés horizontalement par brouettes ou chariots à bras, on peut charger ces matériaux sur des camions sans difficulté quand on dispose d'une plateforme ou tête de chargement à la même hauteur que le plateau du véhicule. Au cours d'un enquête menée par la Building Research Station (Etablissement de Recherche pour le Bâtiment) sur les méthodes de manutention des briques emballées, on a constaté que, dans certaines briqueteries qui n'étaient pas équipées de plateformes de chargement, certains moyens mécaniques étaient nécessaires pour soulever les paquets sur les véhicules sans enlever les briques de leurs brouettes spéciales.

INHALTSÜBERSICHT AUF DEUTSCH

Fortschritte der Materialförderung bei Hoover, Limited Seite 564
Von P. C. MacCullock
Eine Beschreibung der Verfahren und Einrichtungen, die in den letzten Jahren zwecks Verbesserung und Steigerung der Produktion eingeführt worden sind. Die in der Abteilung für Spritzguss, der Gussputzerei und den Bearbeitungswerkstätten durchgeführten Neuerungen sind ausführlich beschrieben und bebildert.

Grösste Maschinmälzereianlage Europas Seite 571
Eine neue Mälzerei, die zur Gänze mit Maschinen britischer Erzeugung erbaut und ausgerüstet ist. Sie gilt als die grösste vollautomatische Anlage Europas.

Ein elektrischer 3 Tonnen Gabelstapler Seite 573
Ausführliche Beschreibung samt Schnittzeichnung eines neuen von I.T.D.. Ltd., hergestellten Schwerlastfahrzeuges.

Neuer Industrietraktor mit dreifacher Verwendung Seite 581
Es ist dies der Massey-Ferguson Industrietraktor Typ 702, bestehend aus einem Traktor mit eingebautem Schürfer an einem Ende und Löffelbagger am anderen. Beide Einheiten sind demontierbar und haben hydraulische Betätigung.

Neue Traktorenfabrik in Schottland Seite 584
Eine Beschreibung der grossen, neuen Fabrik der Caterpillar Tractor Co., Ltd., die in Glasgow eröffnet wurde. Der wohlbekannte Traktor Typ D8 wird nunmehr dort in einem Gebäude mit 5,4 Hektar Dachfläche hergestellt.

Fördereinrichtungen in einem neuen kanadischen Asbestbergwerk Seite 594
Von John Indrod, B.A.(Com.)
Ungefähr 4.8 km an Förderbändern und 8 km an Saugleitungen und Rinnen sind in einem neuen, im Eigentum der Lake Asbestos of Quebec, Ltd., stehenden Asbestbergwerk eingebaut worden.

Materialförderung mit Industrielastfahrzeugen Seine 596
Von L. F. Hoefkens
Teil I einer neuen Artikelreihe, in der vieles über Industrielastfahrzeuge gebracht werden wird.

Thomas Smith & Sons kündigt einen neuen 22½ t Lkw-Kran an Seite 605
Eine Beschreibung des neuesten Modells der von der Fa. Thomas Smith & Sons (Rodney), Ltd., hergestellten Lkw-Kran-Baureihe. Die maximale Hubleistung dieses Krans ist nach britischen Vorschriften 22,650 kg bei 3 m Ausladung unter Anwendung eines 9,1 m langen Normalauslegers.

Das Dempster Kippersystem Seite 606
Ein Fördersystem für Behälter, das in den Vereinigten Staaten weitgehendst verwendet und nunmehr in Grossbritannien durch Lizenznehmer hergestellt wird.

Förderrampe zum Heben in Handkarren transportierter Lasten Seite 610
Von H. G. Vallings, A.M.I.Mech.E.
Wo güter normalerweise mit Handkarren transportiert werden, können diese ohne Schwierigkeit in Lkw verladen werden, wo eine Laderampe in Höhe des Fahrzeugbodens vorhanden ist. Im Zuge einer Untersuchung durch die Building Research Station (Bauforschungsstelle) über die Fördermethoden für verpackte Bausteine wurde festgestellt, dass in Ziegeleien, bei denen keine Laderampen vorhanden waren, für das Verladen der Lasten auf Lkw—ohne die Bausteine aus ihren Spezialtragen zu entfernen—gewisse mechanische Einrichtungen erforderlich waren.

SUMARIO EN ESPAÑOL

Adelantos en la manipulación de materiales en Hoover Pág. 564
Por P. C. MacCullock
Descripción de los métodos y equipo que han sido introducidos en años recientes con objeto de mejorar e incrementar la producción. Vienen descritos e ilustrados detalladamente los cambios que han tenido lugar en el departamento de fundición a troquel, limpieza de piezas y maquinado.

La más grande instalación de maltería mecánica de Europa Pág. 571
Nueva instalación de maltería construida y equipada enteramente con maquinaria producida en la Gran Bretaña, y de la que se afirma que es la mayor de Europa con aplicación de los principios de automatización en todas sus partes.

Una carretilla de horquilla elevadora eléctrica de 3 toneladas Pág. 573
Descripción detallada, con un dibujo recortado, de un nuevo vehículo pesado construído por I.T.D., Ltd.

Nuevo tractor industrial tres-en-uno Pág. 581
Se trata del tractor industrial Massey-Ferguson 702 que comprende un tractor con una excavadora montada en una extremo y una pala mecánica en el otro, siendo ambas unidades desmontables y accionadas hidráulicamente.

Nueva planta escocesa de construcción de tractores Pág 584
Descripción de la nueva y extensísima instalación de la Caterpillar Tractor Co., Ltd., que ha sido inaugurada en Glasgow. El conocido tractor tipo D8 se está produciendo ahora en estos talleres dentro de un edificio cuya superficie cubierta es de 5, 4 hectáresa.

Equipo de manipulación en una nueva fábrica canadiense de amianto Pág. 594
Por John Indrod, B.A.(Com.)
Alrededor de 4, 8 kilómetros de correas transportadoras y 8 kilómetros de tubos de aspiración y canalones han sido instalados en una nueva fábrica de amianto propiedad de la Lake Asbestos of Quebec, Ltd.

Manipulación con carretillas industriales Pág. 596
Por L. F. Hoefkens
Parte I de una nueva serie de artículos que proporcionarán gran riqueza de información sobre el tema de las carretillas industriales.

Anuncio de la nueva grúa Smith sobre camión, 22½ T Pág. 605
Descripción de la más reciente adición al surtido de máquinas montadas sobre camión construídas por Thomas Smith & Sons (Rodney), Ltd. La máxima capacidad de elevación de esta grúa en clasificación británica es de 22.650 kg a 3 m de radio trabajando con la pluma básica de 9,10 metros.

El sistema Dempster Dumpster Pág. 606
Sistema de manipulación de envases que ha sido usado extensamente en los Estados Unidos y que ahora se construye bajo licencia en el Reino Unido.

Rampa transportadora para elevar cargas llevadas en parihuellas o carretillas de mano Pág. 610
Por H. G. Vallings, A.M.I.Mech.E.
Cuando los materiales se trasladan horizontalmente por medio de parihuelas o carretillas de mano, pueden cargarse a camiones sin dificultad si hay un muelle o plataforma de carga a la altura del piso del vehículo. En el curso de una investigación llevada a cabo por la Estación de Investigación del Ramo de la Construcción para conocer los métodos usados para el movimiento de ladrillos empaquetados, se averiguó que en las fábricas de ladrillos no equipadas con plataformas de carga se requerían medios mecánicos para elevar los paquetes a los vehículos sin quitarlos de sus parihuelas especiales.

Fig. 1. General view of floor polisher assembly line with overhead conveyor

MATERIALS HANDLING DEVELOPMENTS AT HOOVER LIMITED

By P. C. MacCulloch*

PREVIOUS ARTICLES devoted to aspects of Hoover Limited's materials handling installations appeared in this journal in 1947 and 1952. The first article dealt in some detail with the floor layouts and the flow of work from receipt of raw materials to final packing and despatch. The latter article was entirely devoted to a description of a conveyor that had been specially erected to handle components of the then recently introduced Hoover polisher.

This article is based on a theme of 'Hoover Revisited'. The intention is to review the situation with regard to materials handling now obtaining at Hoover Limited's Perivale Factory, relate this to any change in design of product, new products, changes in techniques and increased demand, and, finally, to give examples of the practical expression of Hoover's materials handling policy.

Site Conditions

Building design and site conditions must be one of the main governing factors of machine and operational layouts and consequently greatly affect materials handling practices.

Hoover Limited's Perivale factory, with its main production processes housed in three buildings, each of three storeys arranged in a rough 'U' shape and with a limited floor loading on the upper floors, has presented the management with a series of problems in making the most effective utilization of available floor space.

Hoover Limited have had to concentrate within an admittedly constricting site and building area the means to meet an ever-increasing production demand. This has entailed a great deal of ingenuity and careful planning with regard to materials handling problems and, in the writer's opinion, the results in floor layout and the means used in moving materials are good examples of making the best use of available space (see Figs. 1 and 2) supported by the intelligent application of mechanical handling equipment.

Subsidiary Works

Nonetheless there is obviously a limit to the number of machines and departments that can be accommodated within any given area, and Hoover Limited's have had to decentralize some of their component production for finished products made at the Perivale Factory. Two subsidiary works are now in operation; one at Wadsworth Road (115,000 sq. ft.), within a few hundred yards of the main buildings, started production in 1957, the other subsidiary works is that of Abbey Works (23,000 sq. ft.) at Park Royal, a distance of some two miles from Perivale. This was brought into operation in 1953.

The impression gained by a tour of these factories and the main buildings at Perivale is that of a series of highly mechanized operations which, although they could without

* L. W. Bailey & Partners, Ltd.

materially affecting production efficiency be decentralized, have, by reason of the site conditions, been closely integrated. The massive increase in volume of production over the past seven years is a measure of the success of this integration.

Products

The components manufactured and assembled at the Perivale Factory are for the Hoover polisher, the small and large upright vacuum cleaners and the small dustette cleaner—in all some 10 million components per week. The Wadsworth Road factory is primarily concerned with the processing of bar and tube material and the operations involved in the production of dust-collecting bags for the cleaners. Abbey Works at Park Royal produces the spherical Constellation cleaner, the special-purpose double-stretch hose for all the vacuum machines and the additional tools for use with the cleaners.

It has been the policy of Hoover to produce from their own resources as many components as possible and thereby reduce sub-contracting, but consequently increasing the demand on their own production facilities, including materials handling equipment.

Changes in Materials and Design

Another factor influencing material handling are changes in the materials of components or their design. Hoover Limited have been extensively using various forms of plastic for components of their products. Examples are the hood of the 652 large upright cleaner, now an injection moulding of high-impact polystyrene, and the manufacture of the cover of the double-stretch hose by extrusion in p.v.c. An example in change of design is seen in the handles for the upright machines—before and after designs are shown in the photograph at Fig. 3.

Changes in production techniques will affect materials handling arrangements. Many special-purpose machines, designed in the factory, have been, or are being, evolved and installed, and the feeding of these and transfer of work between them has resulted in fairly extensive materials handling schemes.

Thus, although it is true to say that there has been no one major installation of mechanical handling equipment like the conveyor in 1952, there is a constant demand for planning, re-arrangement and re-equipment with regard to materials handling problems.

Mechanical Handling Equipment Investment

The size and importance of this work can be gauged by the capital invested in mechanical handling equipment. In round figures, the budgets for materials handling appropriation over the past three years have been in the region of £20,000 per annum. A representative list of the equipment now in use also serves to give some idea of the size and variety of the materials handling functions taking place at Perivale factory:—

1800 ft.	of overhead powered conveyor
10	Fork lift trucks
20	Platform stacking trucks
11	Stillage trucks
100	Manually operated trucks
20	Electric hoists of between ½ and 3 tons capacity
5	Special-purpose road trailers of 5 tons capacity
10,000	Standard design work trays
4,000	Standard design pallets
700	Large steel stillages

and the above are only the major items.

Couple the foregoing capital investment and variety of equipment with the fact that there are some 50 operators directly concerned within the Trucking Department for the movement of materials, and the scope of Hoover materials handling activities becomes apparent as a major function of production.

Within the management of Hoovers Limited there is a keen appreciation of the importance of this production function. It is still comparatively rare, and thus worthy of comment, for a company even of Hoover's size to appoint an engineer with full-time responsibility for the planning, implementation and co-ordination of materials handling procedures. Hoover created such a position some ten years ago and have consistently provided encouragement and

Fig. 2 (right). General view of armature-winding department

Fig. 3. Example in change of design and its influence on packing and handling. Old-style 912 model shown packed in two cartons, the handle as one piece in foreground. New model 652 packed in one carton, the handle in two halves as shown in the centre carton

backing for the appreciation, among other production staff, of the importance of this responsibility.

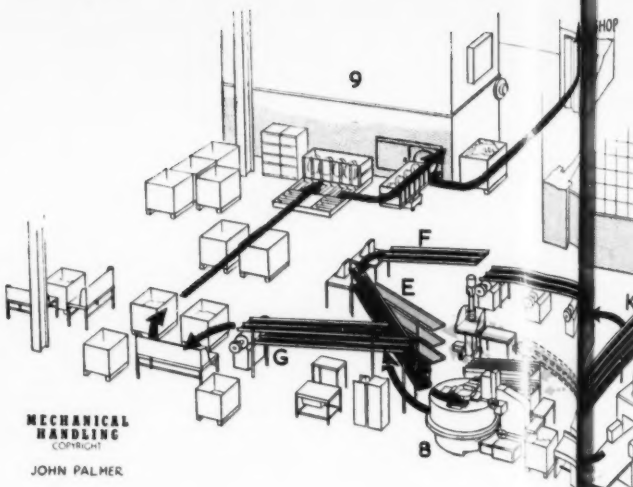
The remainder of this article is devoted to giving examples of how a major company that is generally accepted as being in the forefront of advances in production techniques is always open to new ideas to increase production, efficiency of operations and reduce costs, and is prepared to change or improve past methods as changing circumstances warrant.

Diecast Fettling and Machining Dept. Layout

With particular reference to this last point concerning the company's willingness to make major changes in the interests of efficient production, the following description of the changes made to the fettling and machining of their die cast components is indicative of the company's policy.

Prior to 1958 the main diecasting of the small upright model cleaner, the 1224 model, was cast in one piece, i.e. the hood housing, fan chamber and exhaust duct. This was then transported via a large powered overhead conveyor, 1290 ft in total length. On receipt at the fettling area the casting went through the processes of fettling, milling of faces, drilling, tapping, polishing and inspection, and then went by lift to the first floor for degreasing, painting, and subsequent assembling operations.

1958 saw the introduction of a new model, the 1334, of this small cleaner. For purposes of design efficiency it was decided to make three separate die castings for the housing, fan chamber and exhaust duct. Special-purpose machines for drilling, washing and piercing operations were bought and a new operation layout planned.



The transfer of the bar and tube processing machines to Wadsworth Road gave more space on the ground floor and thus the new machines could be sited most conveniently to the die cast house. The drawing Fig. 4 shows the existing layout and the following is a description of the movement of the components and the sequence of operations.

Sequence of Operations

All castings are transferred in Omicrate pallets by fork lift truck from the die cast house to the storage area shown at the right hand of the drawing. There is sufficient space here for the storage of two days' die cast production—a

Fig. 5. The two sizes of work tray now standard equipment in the Perivale factory

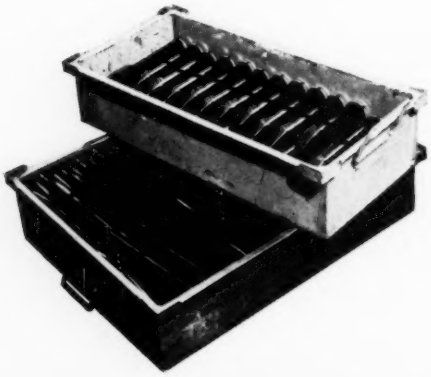


Fig. 6 (left). The two sizes of Omicrate pallets now standard storage equipment in the factories

Fig. 7 (below). Illustration of special caged truck for the storage and transport of packed cleaning tools

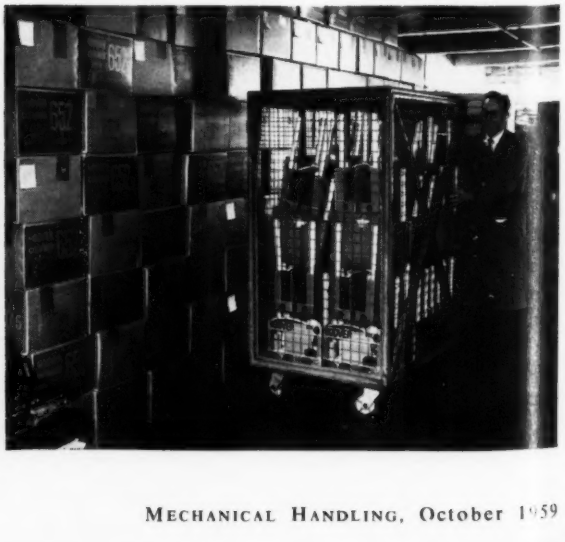
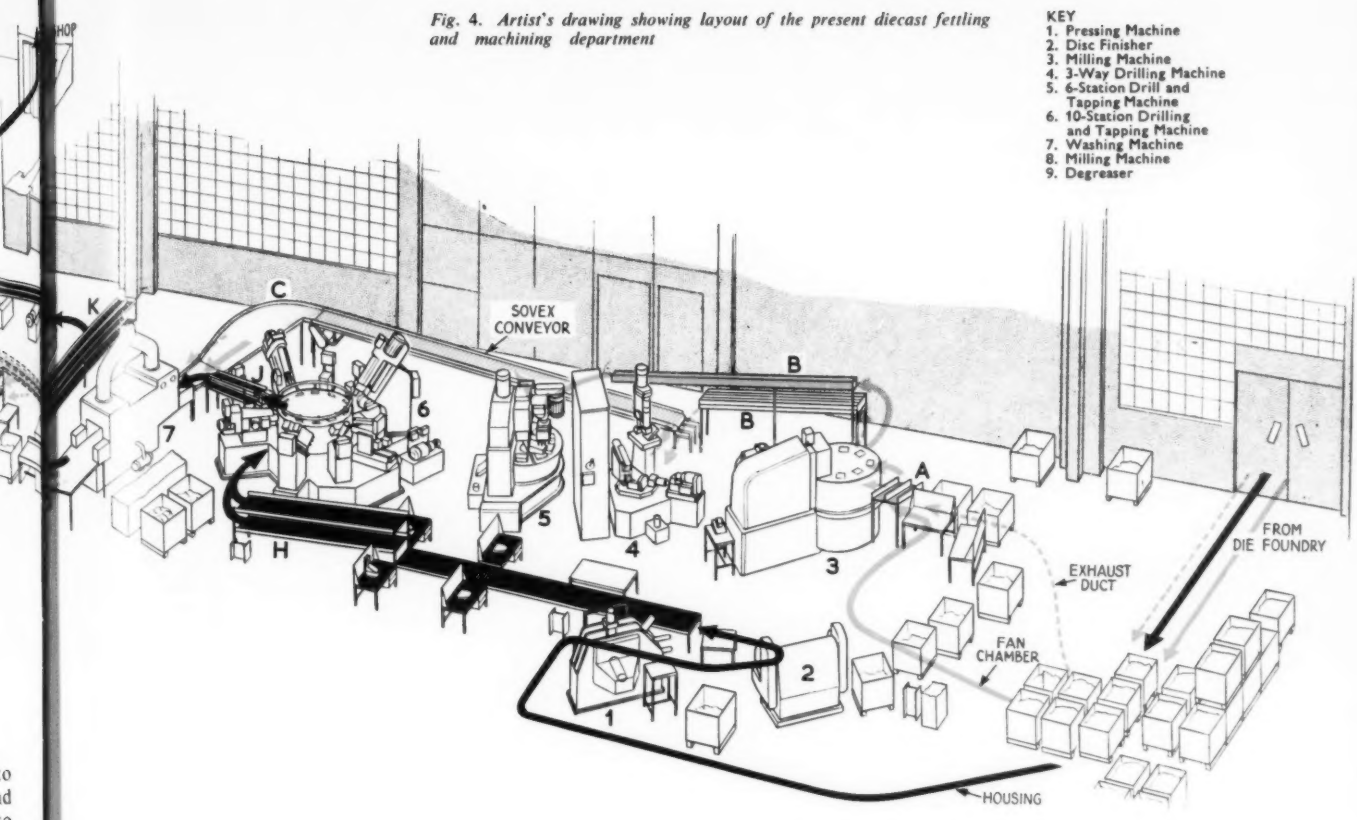


Fig. 4. Artist's drawing showing layout of the present diecast fettling and machining department



feature not available under the old scheme although the conveyor itself did provide storage within its length.

From this storage area pallets of the castings, each pallet holding only one kind of casting, are transferred to the Jackman disc linisher for the first operation. From here, following the coloured lines showing the movement of the components, the fan chamber and exhaust duct to to the second operation of fettling and removal of flash. Both castings are placed on chute A, acting as a transfer and a storage buffer to the next operation—the milling of the joint face on both components on the Wadkin Milling Machine.

From here, as shown on the drawing, the exhaust duct goes, via chutes B, to the Adams 3-way drilling machine where nine holes are drilled, two of which are subsequently tapped at the adjacent Huller tapping machine. The exhaust duct is then placed on a powered band conveyor which takes it and the fan chamber which has been drilled and tapped on the Archdale 6-station drilling and tapping machine, to chute C.

From this last chute the fan chamber and exhaust duct are placed in baskets and fed into the Dawson washing machine for the removal of machine oil and residual water is blown off on chute D.

The next operation is the assembly of the fan chamber and exhaust duct as one unit. This takes place on the assembly bench next to the Herbert drill. At present this transfer from washing area to assembly bench is a manual operation. The intention is to introduce a new chute (indicated by dotted lines on the drawing Fig. 4) between chute D and the fan chamber exhaust duct assembly bench and thus remove the walking and carrying operation now taking place.

After spot facing of the now combined assembly of fan chamber and exhaust duct, the component is transferred via a two-way chute E to an assembly fixture for assembly of the combined fan chamber and exhaust duct into the housing casting which has come through the polishing lathe 'line' via chute F—the three combined components becoming a new part number and called the housing assembly.

This housing assembly is then returned on the two-way chute E to No. 2 Wadkin milling machine for milling of the carpet face of the component and a filing operation. From here the assembly moves, via chute G through a scurfing operation to remove any handling marks etc. and final inspection. After inspection the housing assemblies are placed in Omicrates and moved to the *Efco* degreaser, and from there to the lift for transfer to the first floor for subsequent painting and assembly operations.

The flow of operations for the housing diecasting follows the coloured line on the drawing Fig. 4. The casting is pierced on the hydraulic piercing machine and then passes through a series of fettling operations onto chute H. The next operation is the drilling and tapping of 12 holes and the drilling of six holes on the Archdale 10-station machine. A chute J transfers the housing casting to the Dawson washing machine. After washing, the casting is transferred to transferred to the polishing lathe 'line' via chutes K & L and by chute F to the point of assembly with the fan chamber and exhaust duct assembly.

Materials Handling Equipment

In all there are 11 chutes in this fettling and machining department. All have been designed by Hoover staff and made in their own sheet metal workshops. With the varying rate of operations the chutes, as well as providing a means of transfer, enable buffer stocks to be held between operations. As will be noted, once the castings have been removed from the Omicrate pallets at the beginning of the 'line' all components are kept off the floor and are held, or are moving, in relation to subsequent operations. The one powered

Fig. 8. The special lightweight Hoover designed trays for between process storage of the plastic hood of the 652 model cleaner

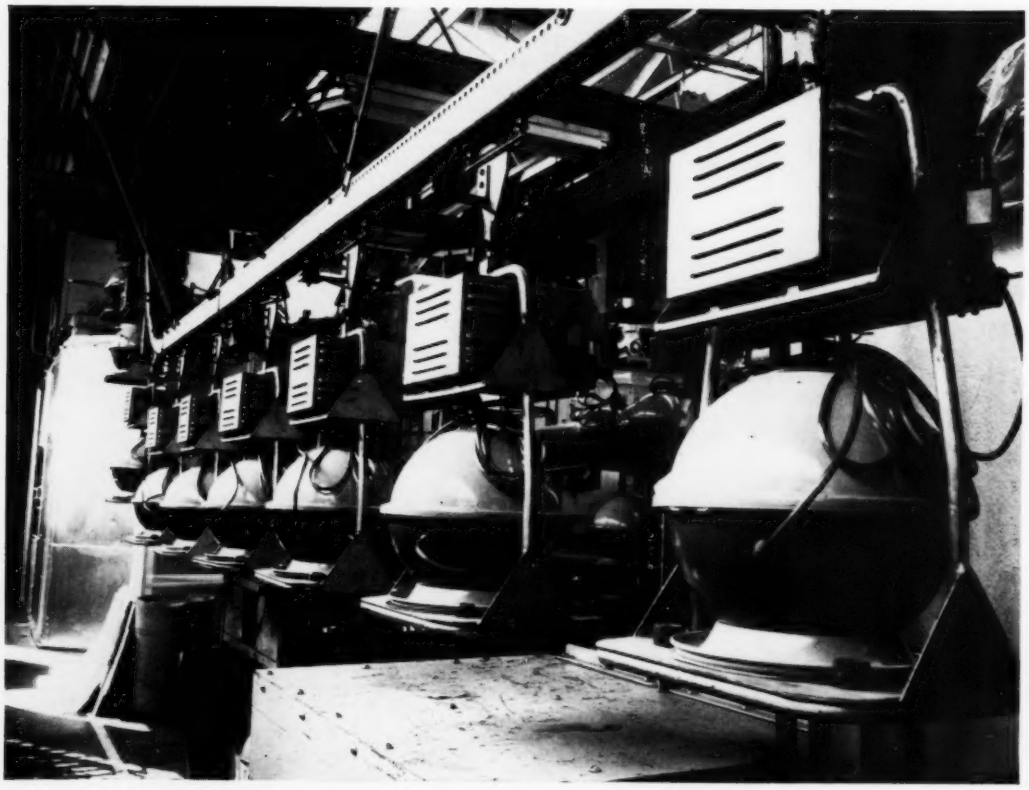
Fig. 9. Illustrating the method of removal of individual 652 plastic hoods from a stack. Note the protective plastic split tube clipped on to the upper bar of the tray to protect the plastic hood from being marked on removal or entry

conveyor between the Archdale 6-station machine and chute C, prior to the washing operation, was supplied by Sovex, Ltd., and its details are as follows—25-ft long, 1-ft wide band and moving at a speed of 40 ft per minute.

As noted before, the introduction of a twelfth chute between the exit of the washing machine and the sub-assembly bench at the Herbert 'C' drill will eliminate the only walking and manual carrying operation in the whole department.

In some instances, e.g. chutes B, L, and G, these are of two tier construction allowing, one, the segregation of components and/or, two, giving extra storage capacity.

Fig. 10. View of the loading and unloading station of the overhead testing conveyor for the Constellation spherical cleaner at Hoover's Abbey works



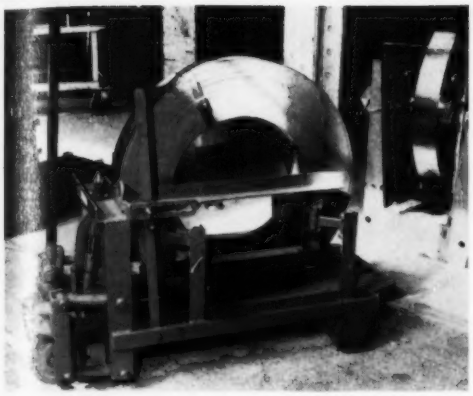


Fig. 11. Specially designed coil strip transporter truck incorporating a squeeze clamp device for holding the coil and a tilting platform for delivery of the coil into the press coilholder shown behind the truck

Chute E is a two-way chute allowing the fan chamber and exhaust duct assembly to go to the final assembly fixture on one side and returning the completed housing assembly on the other.

It can be appreciated, from the foregoing description, that the operational changes involved in introducing the new model have been of some magnitude. In brief, the major changes have been the complete elimination of the 1,290-ft-long conveyor from the die casting house to the fettling and machining 'line', the addition of multi-purpose, automatic machinery, three components now being processed within one line, adequate in-progress storage throughout the line and finally, greatly increased production.

The above description is an example of the type of changes in floor layout and materials handling equipment that is a constant matter of study by Hoover Limited's Planning Engineering Staff.

Other than such particular departmental changes and/or additions, there are further aspects of Hoover's materials handling developments which indicate the factory-wide incidence of an overall materials handling policy.

Standardization of Containers

With the number of different Hoover components that are handled, all varying greatly in size, weight and complexity, it would not be surprising if there was a tendency towards variety in a large number of specially designed containers. In the writer's experience, this tendency for special purpose containers to multiply out of all proportion to their necessity is all too common.

However it has been a policy of Hoover to standardize containers as widely as practicable. In this matter they have achieved a large measure of success in that some 75 per cent of their components can be adequately held and transported in only two sizes of sheet-metal work trays, see Fig. 5. The sides of these trays are respectively 24 in × 18 in × 5 in and 24 in × 11 in × 5 in, in 16-gauge sheet-metal.

The other main containers in use consist of two sizes of the Omicrate welded steel rod box pallet, manufactured by Omic, Ltd., see Fig. 6. These are collapsible and can be stacked vertically by fork truck. The sizes of these pallets are 3 × 3 × 2 ft and a half size 3 × 1½ × 2 ft which enables the smaller size to be stacked integrally with the full size pallet. There are in total some 4,000 of these pallets in use throughout Perivale and the two subsidiary works.

The standardization of containers has been the result of long study and intensive experimentation, and Hoover now anticipate that these two forms of containers will cater for the greater majority of their components in the foreseeable future.

Fig. 12. One of the four 'Dock-o-matic' loading dock ramps. The ramp is shown raised to its maximum height

Special Containers

Nonetheless there are components which, because of their nature, require special handling. An example is the finished carton pack of cleaning tools for all Hoover models. In order to move these in bulk without damage a specially designed wheeled cage pallet is in use., Fig. 7, and this has been found, by experiment, to be the best way of handling these awkwardly shaped packs.

A further example of special purpose container or tray is that shown in Fig. 8. The main technological change at Hoover has been the use of plastics for a number of components and the hood of the 652 large upright cleaner, as mentioned before, is made of high-impact polystyrene. This is easily marked and the special lightweight, inexpensive tray was designed to hold these safely between processes. They are designed to allow any one of the hoods to be extracted from a stacked tier of racks as shown at Fig. 9, and to protect the hood from damage in entry and removal a split tube of plastics has been clipped over the front upper bar of each tray. Each tray holds six hoods, is made of welded wire rod and measures 33 × 24 × 4½ in. They can, as shown in the photograph, be stacked to a considerable height and are normally moved on a wheeled bogie.

The following are a series of, in themselves isolated, examples of the effect of Hoover's constant application of materials handling principles throughout the works.

Use of Overhead Space

The photograph at Fig. 1 shows an application of overhead conveyor at the Perivale works—this particular conveyor, a Geo. W. King, Ltd., Pluplaner, handles components for the Hoover polisher and was described in detail in a previous article in June 1952.

At Abbey Works where the spherical Constellation

vacuum cleaner is produced an installation of this type of conveyor is used as a mobile testing rack, Fig. 10. The dimensions and speed of this conveyor are as follows:—200 ft long with a speed of 10 ft per minute. The length of the conveyor and its speed gives a testing time of 20 minutes and provides adequate storage facility for 40 machines well out of the way of production floor space.

Coil Strip Handling

Hoovers use a large quantity of coil strip and have recently designed a squeeze clamp and tilting truck for the handling of this material on to the coil feed of their presses. This truck is shown at Fig. 11 and was made by Atlas Truck Co., Ltd.

A projected materials handling installation is also related to the handling of coil strip—this is the erection of an overhead gantry crane with a span covering the full width of the stores and running the full length of the area. The present crane is running on a monorail and thus its coverage of the floor area is limited and does not enable the best use to be made of the floor storage area.

Transport

There is a great deal of inter-factory transfer of raw materials, components and finished parts. With the use of the standard Omicrates and of fork trucks for handling them, it was decided to attempt to simplify the unloading and loading of lorries at the factories. A special side loading, enclosed trailer was designed, Fig. 12, and this has proved a flexible and efficient method of transport. The prime mover hauls loaded trailers between the various subsidiary plants and the main works, while fork trucks have complete access to the interior of the detached trailers for loading and unloading purposes. There are now five of these trailers in use, their capacity is 5 tons and there are five roller shutters on each trailer—two on either flank and the normal rear opening shutter.

At the Perivale loading bank the varying heights of delivery lorries have been allowed for by incorporating four hydraulically operated dock loading platforms in the bank, Fig. 12). These are manufactured by Wayne Tank & Pump Co., Ltd., and have a safe working load factor of 10 tons and are operated by electro-hydraulic controls. The working platforms of two of the Dock-o-matics are 6 × 4 ft —the other two are 6 ft × 4 ft 6 in overall size.

Design Changes

On previous models of the upright cleaner, the handle has been of one piece tube—this obviously was a difficult shape for packing and transport. Since 1948 the handles have been re-designed and now consist of two pieces- a before and after photograph is at Fig. 3. The advantages of a more compact arrangement for packing the actual handle and subsequently handling the packed cartons are so obvious as to need no further comment—now that it has been done!

Conclusion

The above examples all serve to illustrate the favourable impression that the writer gained from this review of materials handling developments at Hoover Limited. Their policy of making a particular trained engineer responsible for mechanical handling installations, the continuous factory-wide assessment of where improvements could be made, the ability to be flexible in their attitude to past practices and ready willingness to take advantage of new techniques and methods, the degree of planning and the assessment of the economics of any projected changes and/or additions to the materials handling arrangements, all these factors have, no doubt, greatly helped in the present day production achievements of Hoover Limited.

Fig. 13. Hyster fork truck loading one of the specially designed Hoover trailers via a flank roller shutter entry

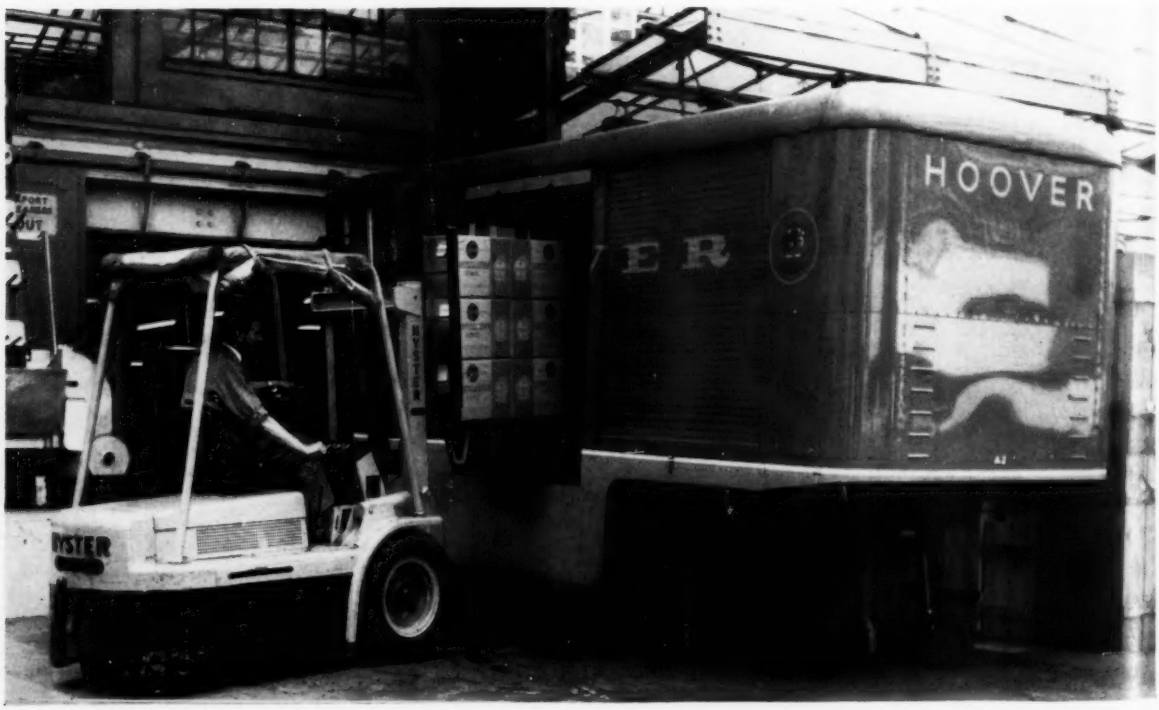


Fig. 1. Steep barley being discharged from a screw conveyor to the box of a Saladin Malting showing a mechanical turnover in the foreground.

LARGEST MECHANIZED MALTING PLANT IN EUROPE

A NEW MALTING PLANT, built and equipped entirely with British-made machinery for Associated British Malsters, has been opened in Knapton, near Malton, Yorkshire. The plant, which is the largest in Europe to use automation principles throughout, will produce enough malt to brew more than 100,000,000 pints of beer a year.

Due to the high degree of mechanization embodied in the plant, labour costs have been drastically reduced. With 'traditional' malting equipment about 180 operators would be needed for the present annual output of 12,000 tons of malt; with the new electrically powered machinery less than 20 operators are required. A.B.M.'s current expansion projects however ensure that there will be no redundancy.

All equipment is arranged on a 'flow production' basis. Green barley from the farmer is taken by elevators, each powered by a 9-h.p. motor, to the top of a silo building. Roughing-out machines then remove any foreign matter and the clean grain descends by gravity to drying machines where powerful fans force hot air through the grain. After broken and small barley corns have been removed, the perfect grain is 'sized' and conveyed to storage silos.

When grain is required for malting, it is conveyed from the silos and steeped in tanks of cold water before being taken to germination boxes. Electrically powered 'turnovers', each using a 5-h.p. motor, travel back and forth, turning the grain in order to ensure an even temperature throughout the box, to control the rate of growth, and to produce the desired quality of malt. At this stage of the process, temperature and humidity are of prime importance.

Fig. 2. Central refrigeration room showing three 100-h.p. 150 rev/min auto-synchronous motors in the foreground. Two 15-h.p. motors are in the background.

3

5

4

Fig. 3. Top conveyor floor Knapton silos showing a 20 ton/hour belt conveyor discharging grain into the silos. Photograph by the 'Yorkshire Post'.

Fig. 4. The Atomizer Room showing Crompton Parkinson 3-h.p. 'Klosd' type motors with atomizer blades attached to their shafts. Water is forced on to the blades, atomized, and then pumped to the germination area where a high degree of humidity is essential.

Fig. 5. Disposal of malting offals by sacking off along the length of screw conveyor.

The necessary conditions are maintained by extensive refrigeration and air-conditioning plant which supplies clean and moist air.

Conditioned air is blown to the germination boxes from a central refrigeration room; in this room are three Hall compressors, each driven by a 100-h.p. 150 rev/min auto-synchronous motor. Two 10-h.p. and two 15-h.p. pump motors are also housed in the refrigeration room.

The grain is then dried and cured in kilns until it is fully malted. When ready for dispatch to the brewers, the malt is automatically weighed on machines installed in the numerous motorized conveyor lines leading to the final dispatch platform.

From the moment it arrives in untreated form, the grain and, later, malt is conveyed entirely automatically either by gravity or electrically powered conveyors and elevators. During processing the average distance a batch of grain travels is just over $\frac{1}{2}$ mile.

Every motor in the plant, there is nearly 1,400 h.p. installed in units ranging from $\frac{1}{8}$ h.p. to 100 h.p., is of Crompton Parkinson manufacture. Power requirement of the electrical plant is 600 kVA. The motors were incorporated into the malting machinery by Rimer Manufacturing Co., Ltd., of Whitchurch, Cardiff, who also designed, supplied and erected all the handling plant, germinating and kiln machinery.

Electrical contractors were the Northern Area Branch of E.C.A. members Edmundsons Construction Co., Ltd. — who, in common with the other contractors involved, completed their part of the work well before the scheduled date.

It is stated that application of automation principles to what has hitherto been a traditionally manually controlled operation will not have an adverse effect upon the final product. No skill has been sacrificed for the sake of speed. Sensitive controls at every stage of the malting process greatly facilitate the invaluable 'personal touch'. In fact, the new methods have even further advanced the existing high degree of hygiene during malting and storage.

6

Fig. 6. Some of the germination boxes where electrically powered turners travel back and forth moving the grain. The 5-h.p. motors propel the turning mechanism against an estimated load of 3 tons.

A THREE-TON ELECTRIC FORK LIFT TRUCK

I.T.D. extend their range of British-built battery-powered equipment with the 624E heavyweight model in the 'Stacatruc' series. Weighing, when fully laden, more than 17,000 lb, the truck is designed to stand up to hard work under rough conditions and can be fitted with solid, cushion, or pneumatic tyres.

1

Fig. 1. Lorry loading and unloading is the principal duty of this 624E fork truck. The jib attachment on a 12-ft mast makes quick work of withdrawing from store and dispatching a Westinghouse rectifier

Fig. 2. Another example of the material handled at the Westinghouse establishment. Imposing a load of 19 cwt at 57 in from the face of the mast, this drum of four-core cable is safely within the stability rating of the cushion-tyred vehicle

2

IN DEVELOPING the 3-ton battery-electric fork trucks now in production in their new works at Webb Lane, Hall Green, Birmingham, I.T.D., Ltd., have followed traditional *Stacatruc* principles. These are directed toward obtaining the characteristics of accessibility, reliability, and manœuvrability, noted in our technical report of the 2-ton 40EH (*Mechanical Handling*, June 1957, pages 320-329), to which readers are referred for a more detailed account of the design features.

Apart from the all-round scaling up occasioned by a 50 per cent increase in capacity, the only basic change that has been introduced in the heavyweight model is the design of the rear axle. To obtain the best possible stability factor for the 3-ton machine, the familiar suspension system employing semi-elliptic leaf-springs and swivelling trunnions has been discarded in favour of a cruciform axle with the fore and aft members pivoting in rubber-bushed housings; an arrangement that permits adequate articulation for rough riding and a reasonable degree of resilience, while having the rigidity needed when handling a load of 6,000 lb at maximum lift.

This system is used in the 6,000-lb diesel *Stacatruc* which has now been in service for more than 18 months; the design, therefore, is proved. Stability is such that 7-in for 9-in pneumatic tyres can be fitted front and rear with only a very slight derating of capacity at maximum load.

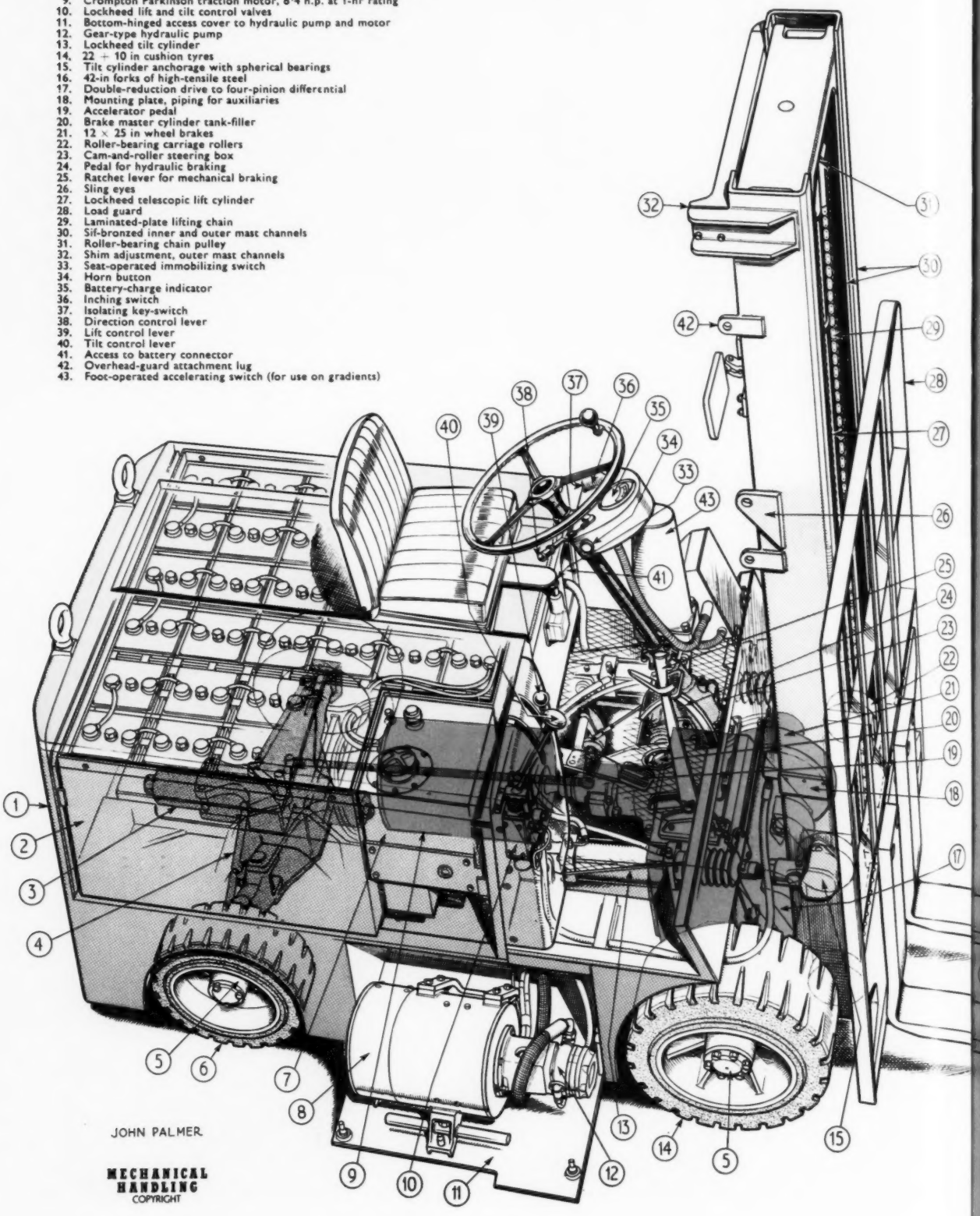
A welcome, though relatively superficial, improvement has been made in the arrangement of the driver's controls and instruments. On the 624E, the battery-charge indicator, horn button, forward-reverse direction control lever, on-off master switch, light switch, and inching switch, are grouped together, with their fuses and terminals, on a panel mounted on the steering column and accessible from behind on removal of a cover plate, an advance on the earlier models in which most of these items were mounted on the wall of the battery compartment out of sight of an operator seated in the driving position.

For the rest, the 624E follows the *Stacatruc* tradition in the rugged strength of the chassis and double-reduction

KEY

1. Cast-iron balance weight extending full height and width of truck
2. Crompton 360-Ah lead-acid battery
3. Alloy-steel steering axle with rubber-bushed spindle mountings fore and aft
4. Ball-jointed steering track-rod
5. Malleable-iron wheel hubs
6. 16½ × 6 in cushion tyres
7. 7-gal tank for hydraulic fluid
8. Crompton Parkinson pump motor, 10·5 h.p. at 15-min rating
9. Crompton Parkinson traction motor, 8·4 h.p. at 1-hr rating
10. Lockheed lift and tilt control valves
11. Bottom-hinged access cover to hydraulic pump and motor
12. Gear-type hydraulic pump
13. Lockheed tilt cylinder
14. 22 × 10 in cushion tyres
15. Tilt cylinder anchorage with spherical bearings
16. 42-in forks of high-tensile steel
17. Double-reduction drive to four-pinion differential
18. Mounting plate, piping for auxiliaries
19. Accelerator pedal
20. Brake master cylinder tank-filler
21. 12 × 25 in wheel brakes
22. Roller-bearing carriage rollers
23. Cam-and-roller steering box
24. Pedal for hydraulic braking
25. Ratchet lever for mechanical braking
26. Sling eyes
27. Lockheed telescopic lift cylinder
28. Load guard
29. Laminated-plate lifting chain
30. Sif-bronzed inner and outer mast channels
31. Roller-bearing chain pulley
32. Shim adjustment, outer mast channels
33. Seat-operated immobilizing switch
34. Horn button
35. Battery-charge indicator
36. Inching switch
37. Isolating key-switch
38. Direction control lever
39. Lift control lever
40. Tilt control lever
41. Access to battery connector
42. Overhead-guard attachment lug
43. Foot-operated accelerating switch (for use on gradients)

Fig. 3. Our artist's impression of the 624E 'Stacatruc'. This has cushion tyres, but 7 × 9 pneumatics can be fitted, twins on front wheels, singles on rear



JOHN PALMER

MECHANICAL HANDLING COPYRIGHT

Table I. **Rated Performance Data for 624E (for loading capacities see Table II)**

	Laden	Unladen
Travelling speed, forward and reverse, m.p.h.	4·75	5
Lifting speed, ft/min	22	28
Lowering speed, ft/min	40	38
Tilting forward through 3 deg/sec		5
Tilting backward through 10 deg/sec	8	
Maximum gradient	1 in 8	

Table II. **Rated load capacities, 624E with cushion tyres**[1]

Load in	Maximum load, lb					
	Lifts under 9 ft		9 ft to 12 ft lifts		Lifts over 12 ft and up to 14 ft	
	Mast[2] Vertical	Mast Forward	Mast[2] Vertical	Mast Forward	Mast[2] Vertical	Mast Forward
18	7,000	5,820	7,000	5,250	6,000	4,890
20	6,630	5,520	6,630	4,970	5,750	4,640
22	6,300	5,240	6,300	4,720	5,450	4,410
24	6,000	5,000	6,000	4,500	5,200	4,200
26	5,730	4,770	5,730	4,300	4,950	4,010
28	5,480	4,560	5,480	4,110	4,750	3,840
30	5,250	4,380	5,250	3,940	4,550	3,680
36	4,670	3,900	4,670	3,500	4,050	3,270
42	4,200	3,510	4,200	3,160	3,640	2,950
48	3,820	3,190	3,820	2,870	3,310	2,689

[1] When pneumatic tyres are fitted the absolute minimum load is limited to 6,500 lb at 18-in centre and *pro rata* down to 6,000 lb at 24-in centre, after which ratings are as for trucks with cushion tyres.

[2] Capacities, with mast vertical, are rated in accordance with the recommendations of BITMA and ASA. Users should guard against overloading.

Table III. **Floor-loading Data for 624E/12 (12-ft mast)**

Load on forks	Load on axle, lb		
	Drive axle	Steer axle	Total floor loading
7,000 lb at 18-in centre	15,200	1,900	17,100
Unladen	3,540	6,560	10,100

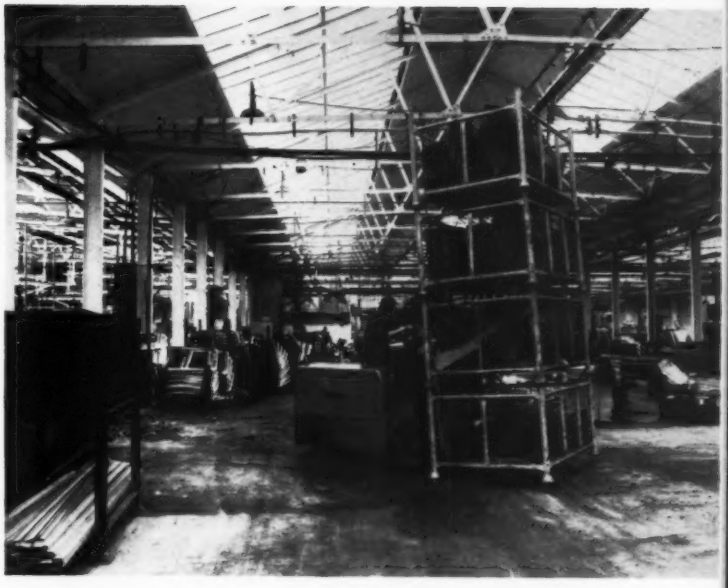


Fig. 4. Substantial economies are gained by handling Austin pressings in composite loads of this size

drive axle and in the capacity of the electric motors, batteries, and hydraulic system, and the associated cables and piping, to sustain a continuous overload. It has the familiar system of controlled acceleration, the cam-and-roller steering, and the soundness of design, materials, and workmanship, that give these machines their characteristic versatility and reliability. It has also maintained their traditional accessibility for servicing and maintenance. Many of these features are revealed in our artist's drawing, Fig. 3, and the sub-assemblies shown in Figs. 7-15.

Features of the Specification

Standard rating for the 624E is 6,000 lb at 24-in load centre and 12-ft lift, with mast vertical. Alternative ratings are available for models with 6-, 9- and 14-ft masts, and these are shown in Table II. Floor-loading figures are tabulated in Table III, and performance data in Table I. Principal dimensions and space requirements are indicated in Figs. 16 and 17.

Chassis.—The main frame and two outer sections are fabricated by welding to form the chassis seen in Fig. 7. The spaced plates forming the central frame support the drive axle, traction motor, and an end-plate on which is mounted the cast-iron ballast weight that extends over the full width and height of the truck and protects the battery.

Power Units.—Power for the traction and pump motors is stored in a 32-cell 64 V SATH 19 Crompton lead-acid battery of 360 Ah at 5-hr rating. This is the standard battery, providing a power supply of 23 kWh, and is ample for normal needs, but batteries of up to 430 Ah (27·5 kWh) capacity can be fitted if exceptionally long shifts are being worked. A 300-A socket is mounted on the housing to allow the battery to be charged *in situ*, and it is normally housed in a container carried on the top of the main frame and lowered vertically into position.

When trucks are working double or triple shifts and the batteries have to be removed for charging and replaced by freshly charged spare units, an alternative type of housing can be provided in which the container is fitted with rollers engaging running strips mounted on the chassis main frame. This arrangement is designed for use with a mobile rail-topped battery-charger trolley, adjustable for height

5

Fig. 5. A good example of economic loading at the works of Joseph Sankey & Sons, Ltd.

Fig. 6. Where the lorry goes, the truck can serve it, cutting turnround time

6

(illustrated in the article on the 40EH *Stacatruc* published in the June 1957 issue), which is brought alongside the truck. The battery, in its container, can then be pulled by hand on to the trolley and taken away for charging. One man can transfer a battery to or from the trolley and wheel it away.

Both the prime mover and the motor driving the hydraulic pump are Crompton Parkinson totally enclosed 4-pole units with laminated poles and armature cores. They are fitted throughout with class B insulation to enable them to withstand heavy overloads and combat excessive heat generation. Armatures are mounted on fully protected grease-lubricated ball-bearings and large contact areas are provided on the brushes and commutators.

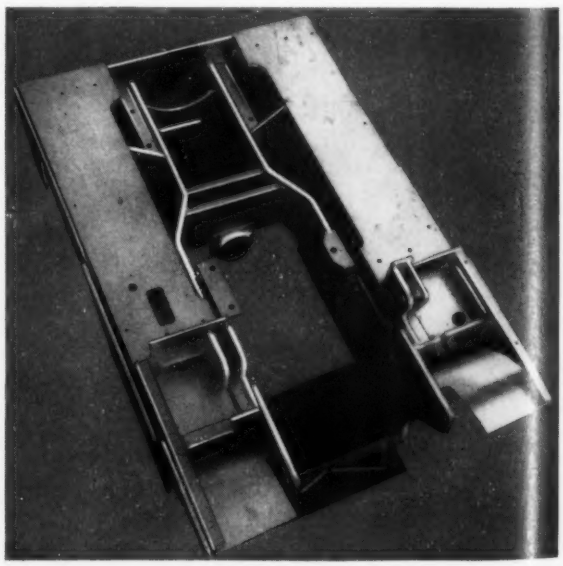
Both motors are rated for arduous duties. The traction motor, which is series-wound to provide the necessary speed stages, delivers 8·4 h.p. at a 1-hr rating. The pump motor has an output of 10·5 h.p. on a 15-min rating and incorporating a system of compound winding designed to limit the no-load speed and ensure smooth oil circulation at constant velocity and adequate pressure.

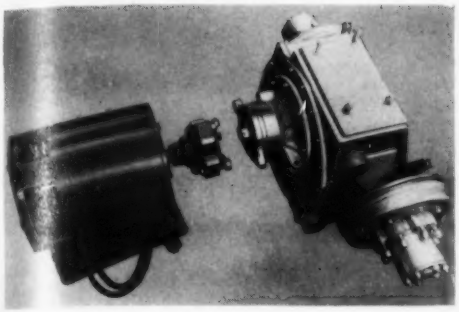
As noted in our previous report on *Stacatrucs* that had been worked hard for several years, these Crompton Parkinson motors do their job extremely well, and are largely responsible for the smoothness and lack of fuss that characterize the performance of the trucks in the I.T.D. range.

Front Axle and Transmission.—The drive to the roadwheels is taken through a fully flexible Layrub rubber-bushed coupling and a double-reduction front axle of extremely robust construction. Transmission is through spiral-bevel and spur gears to a four-pinion differential, the final drive being taken through halfshafts to fully floating hubs. The traction motor, with coupling attached, and the axle assembly, are shown in Fig. 8. The front view of the partially assembled truck in Fig. 9 indicates the robust character of the front end-structure.

Rear Axle and Steering.—Fig. 10 shows clearly the cruciform construction of the rear axle and the method of obtaining articulation. The axle is fabricated from alloy steel and has two arms pointing fore and aft and carrying spindles enclosed in rubber bushes. These bushes are located in cylindrical housings on the main frame, which can be seen in Fig. 7, thus permitting the axle to pivot laterally when the wheels are deflected vertically on rough

Fig. 7. The 624E is based on a robust all-welded chassis





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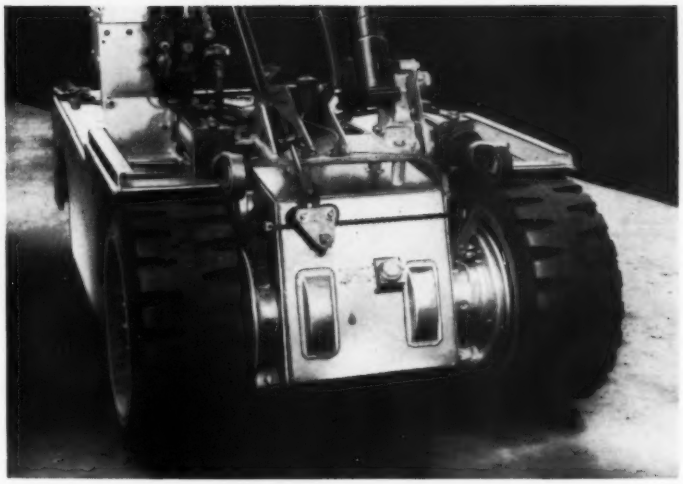

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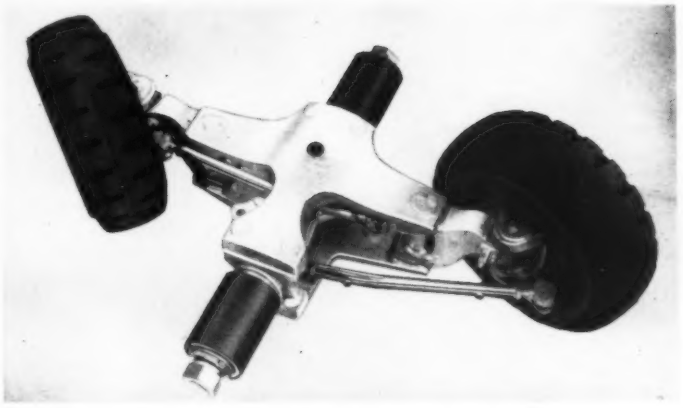
Fig. 8. Traction motor with Layrub coupling attached, and rear axle assembly

Fig. 9. Robust construction of the drive-axle assembly can be seen in this front view of the partially assembled truck

Fig. 10. Cruciform rear axle with rubber-bushed pivot arms

Fig. 11. A fitter demonstrates the speed with which the pump motor is removed from its housing in the offside pannier

Fig. 12. Brushes are readily accessible



10

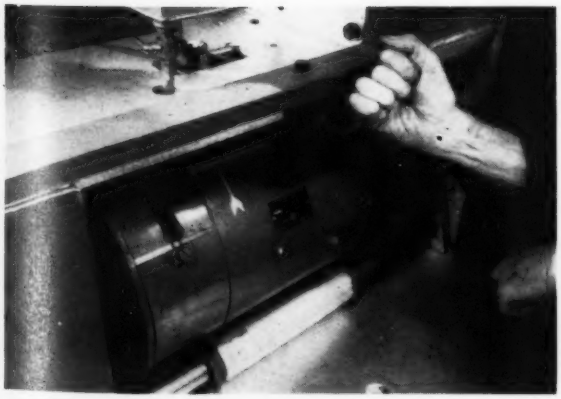
12

ground without transmitting a rolling motion to the chassis, and also affording a measure of shock-absorption through the torsional rubber mountings.

The steering linkages operate in the orthodox manner, through track rods fitted with protected taper-mounted ball joints. They act upon the rear wheels, which are mounted on drop-forged alloy-steel stub axles running on needle roller bearings and pivoting on case-hardened king-pins.

Wheels, Tyres and Brakes.—Fabricated steel disc-wheels are secured to malleable-iron hubs by spherically seated

11A



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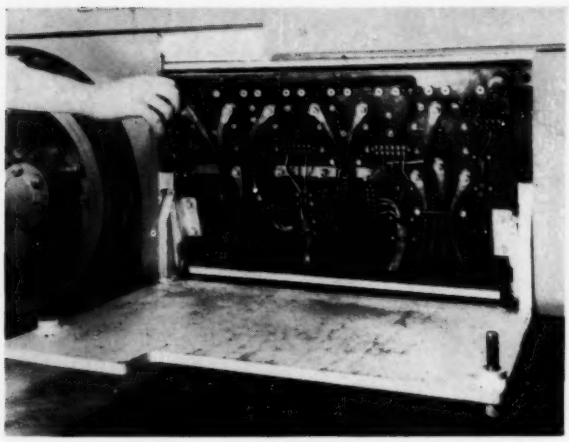
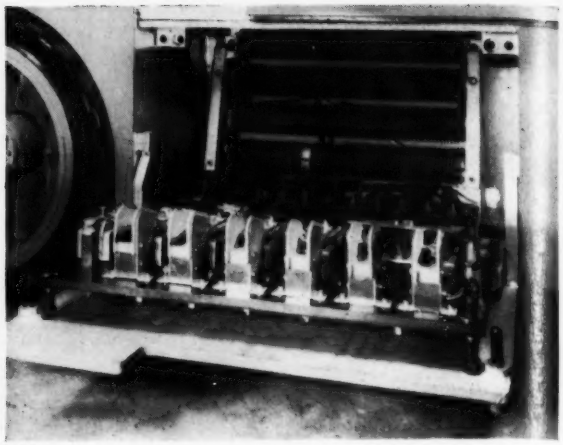


13(a)



13(b)

Fig. 13. *Hinged plate gives access to electric control gear*
(*a*) *Wiring to contactor panel*
(*b*) *Contactor panel swung downward to expose resistance*

studs. Cushion tyres are fitted as standard; 22 × 10 × 16 in at the rear and 16¼ × 6 × 11¼ in at the front. Alternatively, 7 × 9 pneumatics may be fitted, twins on each of the front wheels and single tyres at the rear.

Braking is on the front wheels by means of hydraulically operated internal expanding shoes with bonded linings providing an effective frictional area of 12 × 2·25 in.

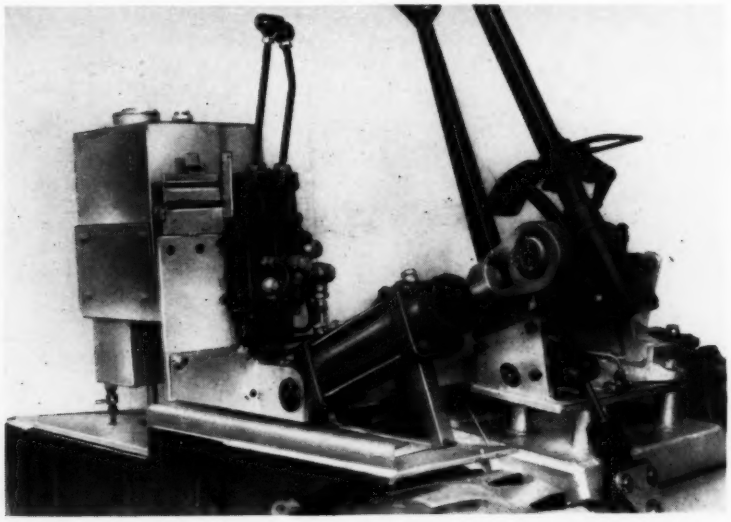
Mast and Fork Assembly.—Braced to form a rigid assembly, the inner and outer mast channels, when nested together, have an overall section of 8 in depth. Rubbing surfaces are sif-bronzed to resist abrasion, and clearance between the fixed and sliding members is adjustable by means of shims inserted between the outer channels and the transverse tying member at the mast head. Heat-treated high-tensile forks are carried on a solid plate, on which are mounted two pairs of rollers running on needle roller bearings that engage the inside surfaces of the inner mast channels. Each of the two laminated-plate lifting chains will support the rated load. The assembly of load-carrying members presents a robust and even massive appearance.

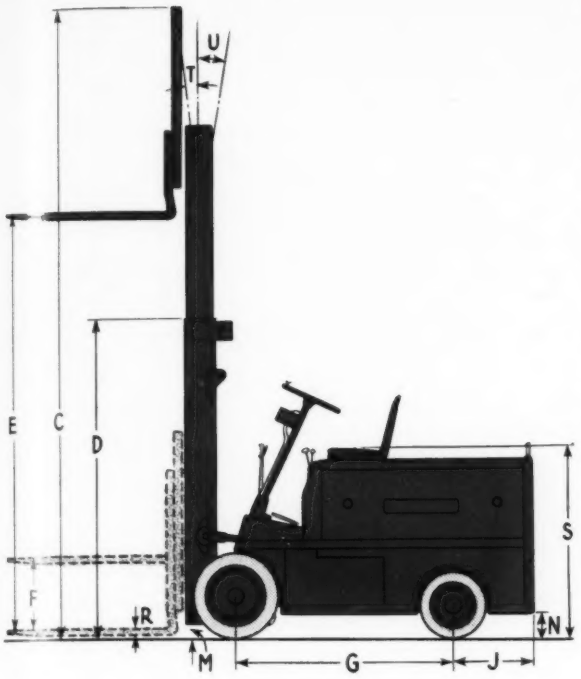
Care has been taken to make adequate provision for the stresses set up by the forward and backward mast tilt by fitting large pivot brackets with generous bearing surfaces and removable bearing caps. Side thrusts in the masts are resisted by bracing members, and those in the carriage by slippers of adequate depth.

Hydraulics.—Pressurized fluid for the single lifting ram and two tilt rams is delivered at high volume and a lower pressure than in previous *Stacatruc* systems by a Hamworthy 1505 gear-type pump. The pump is directly coupled to the

Fig. 14 (RIGHT). *Instrument panel and foot-operated accelerating switch* (*covers removed*)

Fig. 15. *One of the tilt-ram assemblies* (*propped in position*) *and the hydraulic control valves*





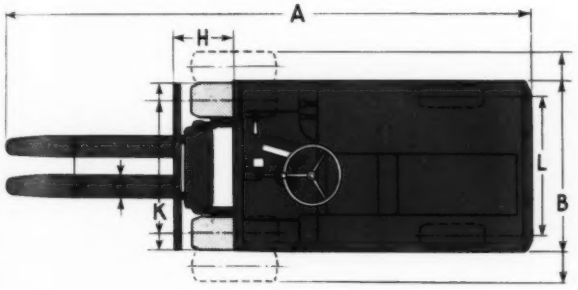


Fig. 16. Principal dimensions, in inches, of 624E 'Stacatruc' fitted with standard 42-in forks

Key

			inches
A.	Overall length	131⅜ in pneumatic 128⅜ in cushion	
B.	Overall width	44 in	
C.	Overall height, mast raised	624E/6	116
		624E/9	164
		624E/12	200
		624E/14	224
D.	Overall height, mast lowered	624E/6	64½
		624E/9	83
		624E/12	101½
		624E/14	114½
E.	Lift height	624E/6	72
		624E/9	108
		624E/12	144
		624E/14	168
F.	Free lift	624E/6	27⅞
		624E/9	29
		624E/12	21⅜
		624E/14	19⅜
G.	Wheelbase	53 in cushion 54 in pneumatic	
H.	Front overhang	18½ in	
J.	Rear overhang	17⅜ in	
K.	Track, front	33½ in	
L.	Track, rear	35½ in	
M.	Ground clearance under mast	3½ in laden	
N.	Ground clearance centre and rear	5½ in	
P.	Fork spread	12 in minimum 42 in maximum	
Q.	Fork width	6 in	
R.	Fork depth, maximum	2 in	
S.	Height of driver's seat above ground level	46½ in	
T.	Forward tilt	3 deg	
U.	Backward tilt	10 deg	

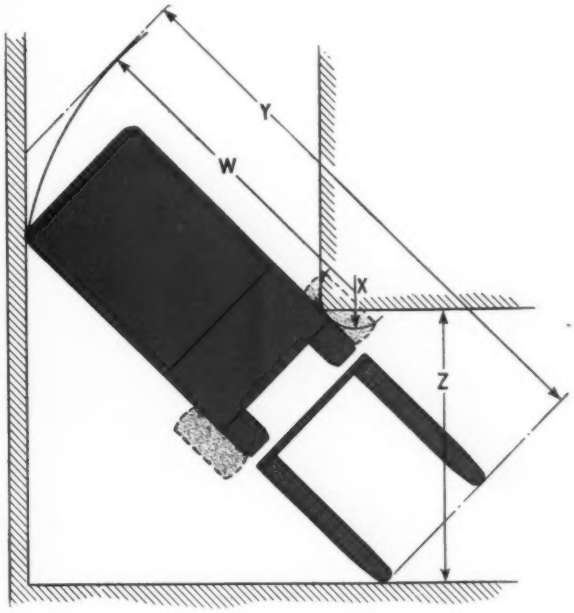


Fig. 17. Space requirements, in inches, of 624E 'Stacatruc' fitted with 42-in forks. These are minimum dimensions to which working allowances must be added

Key

		Cushion	Pneumatic
W.	Outer turning radius	7 ft	7 ft 3½ in
X.	Inner turning radius	5 in	—
Y.	Minimum aisle for 90 deg stacking	12 ft	12 ft 4 in
Z.	Minimum intersecting aisle	6 ft 9 in	7 ft 7 in

drive motor, with which it is mounted as a unit on a hinged panel. The ready accessibility of the pump-motor assembly is illustrated in Fig. 11 and 12.

Working pressure at the full rated load of 6,000 lb is 1,450-1,475 lb/sq. in., and the circuit is protected against building up of excessive pressure by a Lockheed pilot-operated relief valve. To allow the rated load to be exceeded when its centre of gravity moves toward the heel of the forks, the relief valve is usually set at 1,700 lb/sq. in., at which pressure a load on the forks of 7,000 lb can be sustained. Another Lockheed valve controls the flow of oil from the lift cylinder and prevents the mast from dropping suddenly in the event of a fall in pressure. The tank has a capacity of 7 gal and is equipped with a filter.

Controls.—Travelling speed is controlled by the established *Stacatruc* method, in which an air dashpot is employed to delay acceleration and a series of tapped resistances provide automatic predetermined increments of torque through four evenly spaced steps. Electromagnetic control gear, by John Morris & Co., Ltd., incorporates silver-tungsten button contacts and permanent-magnet blow-outs.

The system transmits high torques and gives smooth speed gradations. It is operated by means of a forward-reverse lever under the steering wheel and a plate-type accelerator pedal on which the driver's foot rests at a comfortable angle. Supplementary inching control is available if required.

Interlocks protect the traction motor from becoming overloaded if the direction of travel is reversed while one of the upper speed stages is engaged. Another makes it

impossible to engage high speeds while the handbrake is on, but this can be by-passed by the operation of a foot switch when taking off on a gradient. An isolating switch cuts off the current to the motor when the driver takes his weight off the seat.

The footbrake operates through a Girling hydraulic system; the handbrake through mechanical linkages.

Arrangement of the driver's controls is better than in previous models. Lift and tilt levers are grouped under his right hand and operate through Lockheed spool-type control valves in a bank below, to which extra units can be added at any time for the operation of additional attachments.

Instruments include battery-charge indicator, horn button, forward-reverse switch, fuse box, isolating switch, and lighting and inching switches, and are mounted with the fuse and terminal boxes on an inclined panel attached to the steering column. They are accessible from underneath on removal of the cover plate, as shown in Fig. 14.

Attachments.—All the usual alternative lifting attachments are available, including jib, boom, scoop, rotating head, rotating reel-clamp, load clamp with interchangeable carton clamp, *Accopac* prongs, and load-steady. Extra equipment includes side shift and fork-extension sleeves. The I.T.D. *Stacatrailer* can be attached to the towing eye recessed in the balance weight.

Machines in Service

Three users of the 624E allowed us to visit their premises and see trucks at work on the operation. At the head office, spares and service depot of Westinghouse Brake & Signal Co., Ltd. (Figs. 1 and 2) the truck handles a variety of the company's products, including plating sets, brakes, signals, rectifiers, and compressors, stored and serviced at the depot, and a variety of other supplies associated with their outside contracts. At the time of our visit, the *Stacatruc* had been in operation for about two months, engaged principally on vehicle loading and unloading, working throughout the day and having its batteries recharged at night by a VZ 32/45 Westinghouse charger.

In manipulating the various and awkward loads it was called upon to handle, and negotiating narrow doorways and tight corners in the stores, the 624E had already gained the reputation of being a tough and handy machine, whether used with forks or with crane jib.

1,000th Jones KL 66 Mobile Crane

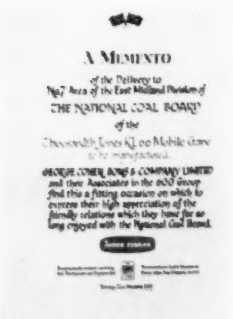
At the Letchworth works of K. & L. Steelfounders and Engineers, Ltd., recently, the one thousandth Jones KL 66 crane to be built there by this 600 Group company was handed over to officials of the National Coal Board by Mr. Frank Rowe, the company's Managing Director. The thousandth crane, together with two others handed over at the same time, represents part of a recent large order for Jones cranes from the East Midlands Division of the N.C.B., and was formally handed over to officials of the Divisions's No. 7 Area, Cole Orton, Leicestershire. Present representing No. 7 Area were Mr. L. V. Smith, Assistant Area General Manager; Mr. F. Ashley, Area Chief Engineer; and Mr. D. E. Cooper, Purchasing & Stores Officer.

The Jones KL 66, a 6-ton capacity machine, was first introduced in 1951 and has been consistently successful from the start. Originally a standard mobile, it has since been supplied on lorry, rail and crawler chassis with equal success and its range of application has been further increased by the more recent addition of the 4-wheel steering mobile chassis.

Among other features first introduced on this versatile crane are the totally enclosed and interchangeable transmission units for the four motions—hoisting, slewing, derricking and travelling. Although now adopted as standard on subsequent models, this important part of the direct diesel mechanical transmission system used on all Jones cranes was pioneered on the KL 66. Equally, it was the KL 66 that first showed that when allied to a direct transmission system a 4-wheel differential drive to the travel wheels could give a pneumatic-tyred mobile crane a travel performance on rough ground that closely approximated to that of a crawler chassis without any sacrifice of speed and mobility on good going.

The National Coal Board is among the largest users not only of the KL 66 but of all Jones cranes. The coincidence of the one thousandth KL 66 being due for delivery to them was thus a happy one from the point of view of the Letchworth company's associates, George Cohen Sons & Co., Ltd., who handle all U.K. sales of Jones cranes. The total number of Jones cranes actually in service in the various Divisions of the N.C.B. is just under 250.

Fig. 1. The handing-over ceremony. Left to right: C. S. Shaw, Technical Director K. & L. Steelfounders; D. E. Cooper, Purchasing and Stores Officer N.C.B. East Midlands Division; Frank Rowe, Managing Director K. & L. Steelfounders; L. V. Smith, Assistant Area General Manager and F. Ashley, Area Chief Engineer, N.C.B. East Midlands Division


A Memento

of the Delivery to

No.7 Area of the East Midland Division of

THE NATIONAL COAL BOARD

of the

Thousandth Jones KL 66 Mobile Crane

to be manufactured

by

GEORGE COHEN, SONS & COMPANY LIMITED

and their Associates in the 600 Group

find this a fitting occasion on which to

express their high appreciation of the

friendly relations which they have for so

long enjoyed with the National Coal Board.

Fig. 2. A memento in the form of an illuminated address presented to L. V. Smith, Assistant General Manager, East Midlands Division N.C.B.

The Board's Jones cranes fall roughly into two categories—those employed on the handling of coal itself and those used for stores handling, maintenance work and similar general handling duties. Those in the first category are for the most part the model KL 44, while the choice of models for the more general duties has been wider, including of course the Jones KL 66.

NEW THREE-IN-ONE INDUSTRIAL TRACTOR

MASSEY-FERGUSON, LTD., for many years well known as manufacturers of agricultural tractors and mechanized farm equipment, have now entered the industrial field, and the first item to be built in this country at the recently acquired Coventry factory was recently demonstrated to the Press. This is the Massey-Ferguson 702 industrial tractor, comprising a tractor with a digger mounted at one end and a power shovel at the other, both units being detachable and hydraulically operated. In addition, the range of work can be extended by fitting various other attachments, mentioned later.

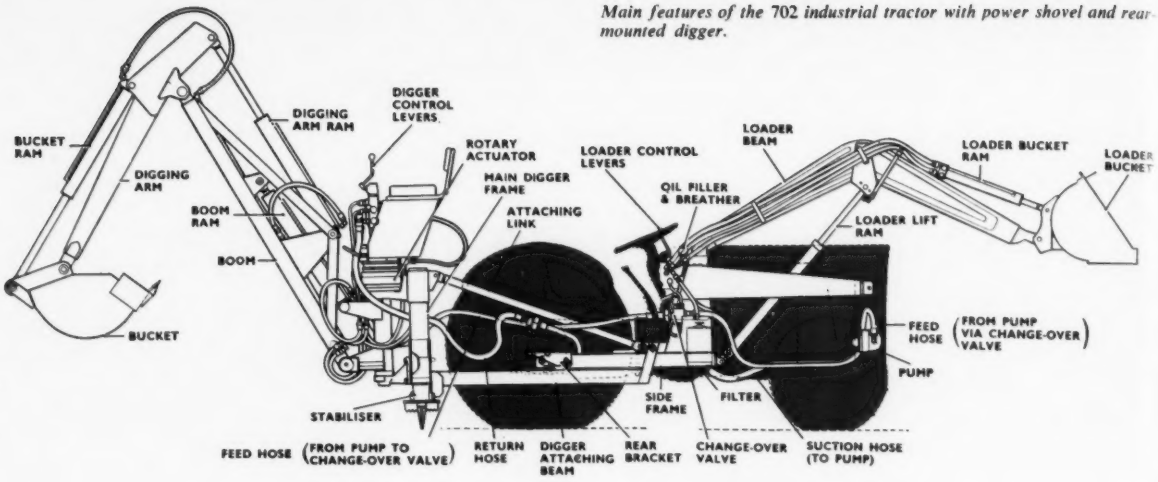
The Tractor Unit

The tractor is powered by a 37-b.h.p. diesel engine. The throttle can be operated either by hand or foot: the provision of the foot throttle leaves the operator with both hands free for changing gear and operating the shovel hydraulic control levers. A useful feature is the provision of power steering which, even with a fully loaded shovel, makes it possible to turn the steering wheel with one finger. However, in the event of power failure, etc., manual steering is possible. Two types of braking are available, i.e. either the conventional brake layout or a dual braking system comprising foot brake and hand brake. There is also a choice of lighting kits, one of which includes two rear working lights.

It is well known that in service, tractor equipment is subjected to very rough handling, and for this reason special attention has been given to ensuring maximum strength where it is needed: that this has been done without unduly increasing the weight may be seen from the fact that the total weight of the tractor including fuel, oil and water is only 3,785 lb. Another useful feature is that the front of the tractor is designed as a very sturdy 'bumper grille', allowing it to be used with safety for 'pushing' applications.

The tractor is available either with or without the well-known Ferguson hydraulic system. If the shovel and digger attachments are to be fitted, a separate high-capacity pump is mounted on the front axle support and driven direct from the engine crankshaft. To clearly distinguish this industrial equipment from the Company's agricultural equipment, it is painted a distinctive yellow colour.

The Massey-Ferguson 702 industrial tractor fitted with a power shovel and rear-mounted digger. It is claimed that a 6-cu. yd. lorry can be loaded in 6 min



Main features of the 702 industrial tractor with power shovel and rear-mounted digger.

The Rear-mounted Digger

The rear-mounted hydraulically operated digger is a self-contained unit which can be dismounted from the tractor in 5 min by removing two hydraulic pipes and four pins: no special hoists or tools are required to do this. It is of new design and is said to be the only digger that can be offset to either side to permit flush digging alongside existing walls, etc. Because the digger is carried on the same sub-frame as the loader, the tractor itself is completely protected from digging stresses and strains.

The unit is operated by a high-capacity gear-type pump at a pressure of 1,850 lb/sq. in. The hydraulic systems of the digger and shovel are isolated from each other by a simple changeover valve, and the digger is operated by a control bank of six levers conveniently placed for the operator, whose seat swivels with the boom of the digger. This means that the operator is always facing his work, has unobstructed vision, better control and is himself less subject to fatigue. Two levers control independent vertical stabilizer feet, which can be used to level up the digger on sloping ground or to enable undercut excavations.

The operation of the digger is extremely simple. The boom is raised or lowered by pulling or pushing the first lever. The second lever operates the rotary actuator: pushing it swings the boom to the left, and pulling swings it to the right. The digger arm is controlled by the third lever, which is pulled to bring the arm towards the operator or pushed to extend it. Bucket crowd is controlled in a similar manner by the fourth lever.

When centrally mounted, the digger has a 185 deg operating arc and is capable of digging at right angles to the tractor centre line, thus enabling it to work in confined spaces. It has a reach of 13 ft 8 in or 17 ft 5 in from the centre of tractor rear axle and can dig down to a depth of 12 ft. When using a trench bucket there is a dump clearance height of 8 ft, which increases to 10 ft 2 in if a face shovel is fitted.

A variety of standard buckets in a number of sizes is available.

The Power Shovel

The power shovel, designed specially for use with the 702 tractor, can be detached in 5 min by removing five hydraulic pipes and two pins, thus enabling the tractor to be employed for other purposes if so desired. Alternative buckets for different applications are available, as well as various special attachments such as a fork lift, angle dozer, crane and scarifier. It is claimed that outputs exceeding

The 710 digger in use for ditch clearance

60 cu. yd./hr are possible when working with coke and loose gravel.

The shovel is of rigid box-frame design and mounted on the same sub-frame as the digger, thus protecting the tractor from loading stresses and strains. The loader arms pivot on replaceable hardened steel pins and bushes. The shovel is capable of lifting 2,000 lb at 2,000 r.p.m. on the engine, with breakaway at 3,000 lb. An overall lift height of 11 ft 8 in is possible, with a bucket clearance height of 9 ft 8 in and a dump height of 8 ft 6 in.

Two self-centring levers control the movement of the shovel arms and the bucket. Pulling and pushing the left-hand lever raises and lowers the lift arms, which can be lowered slowly by pushing the control lever slightly forward for fast lowering the lever is moved fully forward. The right-hand lever is for setting the pitch of the bucket for loading, digging or dumping.

All hydraulic hoses have re-usable ends, a feature which simplifies replacement and maintenance. If a digger is not mounted on the other end it is necessary to fit rear wheel weights and to ballast the rear tyres.

This view illustrates how the digger may be removed as a unit in order to permit the tractor to be used for other purposes, in this case grading

Showing how, by mounting the digger at one side of the frame, it is possible to use the equipment for flush digging alongside walls, etc. →

This crane attachment has an adjustable jib which, when fully extended, will lift a load of 1,000 *lb to a height of* 16 *ft*

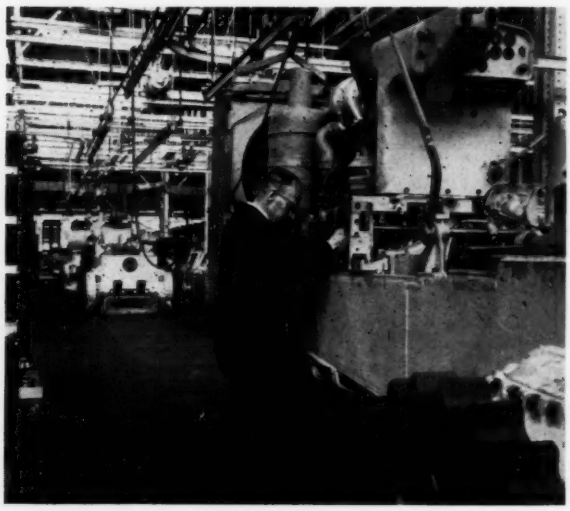
SCOTLAND'S NEW TRACTOR PLANT

Fig. 1. View of the Glasgow plant from the South West

WHEN the Scottish factory of the Caterpillar Tractor Co., Ltd., was planned, site and facilities were all-important. Availability of high-quality steel and skilled labour were first essentials, while road, rail, sea and air communications were next in priority. Of all the sites considered Tannochside, near Glasgow, had the highest score and in June 1956 work commenced on 13½ acres of building site. Allowance has been made for future expansion and in all some 65 acres of land has been purchased.

Before any work was carried out both the architects and consulting engineers visited the American factories of the parent Caterpillar Tractor Co. at Peoria and Decatur, Illinois. The latest developments in tractor plant design were studied and the findings incorporated in the design and layout of the Scottish plant. The problems involved in the planning and construction of this factory were very considerable indeed, not only in the actual work of building but also in the preliminary site clearance operations.

Fig. 2. Controls for the petrol starting engine are connected up on the moving tractor assembly line



Work could not commence at the site before a decaying mining village, once the centre of several important pits now either closed or due for closure, was demolished and cleared. Nearly half a million cubic yards of soil were removed from the high areas of the site and deposited on the hollow regions and treated by scientific methods with a view to restoring the upfilling to a predetermined degree of compaction approximating to its former natural mechanical characteristics. The project was one of the first in Scotland in which solid compaction on a large scale has been adopted. A special site soils laboratory was set up to ensure accurate control of compaction. Colville's steel works, whose proximity to Tannochside greatly influenced the decision to build there, supplied 40,000 tons of Clugston slag forming the foundations of the plant, and also manufactured the silver-grey slag facing bricks used internally.

The total construction period for the civil engineering work was 21 months. During the first six months the contractor was seriously hampered in his operations by adverse weather but the construction of the numerous heavy extension foundations were carried out concurrently with the site clearance and earth-moving, so that the structural steel work on the main factory was under way in the early months of the work. Within the factory there are many heavy plant foundations constructed below floor level with large and complicated pits to serve the needs of various processes and to accommodate the 'below the ground level' parts of various machines. Immediately under the main office block a deep pit is incorporated which serves as accommodation for the heating and ventilating plant of the general office building. The factory floor is of reinforced concrete with various finishes to suit the duties required and covers a total area of 15 acres; one building alone covers almost 14 acres.

Underground services for the factory involved some 4½ miles of water-mains and gas-mains, storm-water sewers, etc.,

and, because abnormally large quantities of water were necessary for process and domestic supply, twin underground storage tanks of 250,000 gal. capacity were constructed. An underground pumping station incorporated in an adjoining compartment pumps the water into an elevated water tower of 250,000 gal capacity.

The general plan of the factory is a simple one. The main and largest building houses everything necessary for production, raw materials, machine tools, assembly line, engine test, tractor assembly and final tractor test beds. As can be seen from the illustration the production flow commences at the north-east corner of the main building and finishes about a quarter of a mile away at a centre doorway at the west side. Built above the section of this main building is a second floor which contains cafeterias, kitchens, locker-rooms, etc. There are two office buildings, general office and employment relations. The first building is a two-storey construction and includes an auditorium with a seating capacity of 250, which is used for large Company conferences and social activities. The second building is single-storey and accommodates medical services.

The electrical power requirements of the factory are in the order of 6,000 kVA, of which about 50 per cent is absorbed in the heat treatment furnaces and induction equipment. In order to meet this load, substantial additions were required to the South of Scotland Electricity Board's distribution network and the supply to the factory is brought in through 11,000-V underground cables.

Distribution of electricity, which is large, relative to the floor area of the factory, is based on the practice current in the American automobile industry, that of taking the high-voltage supply right up to the centres of distribution.

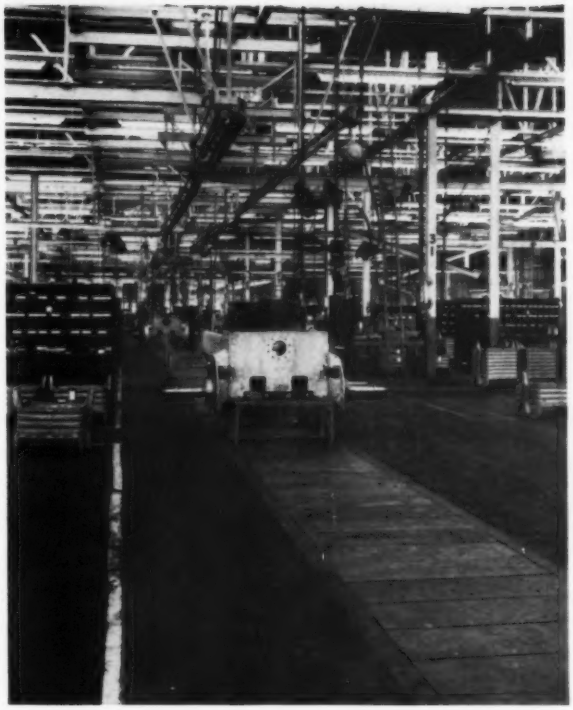
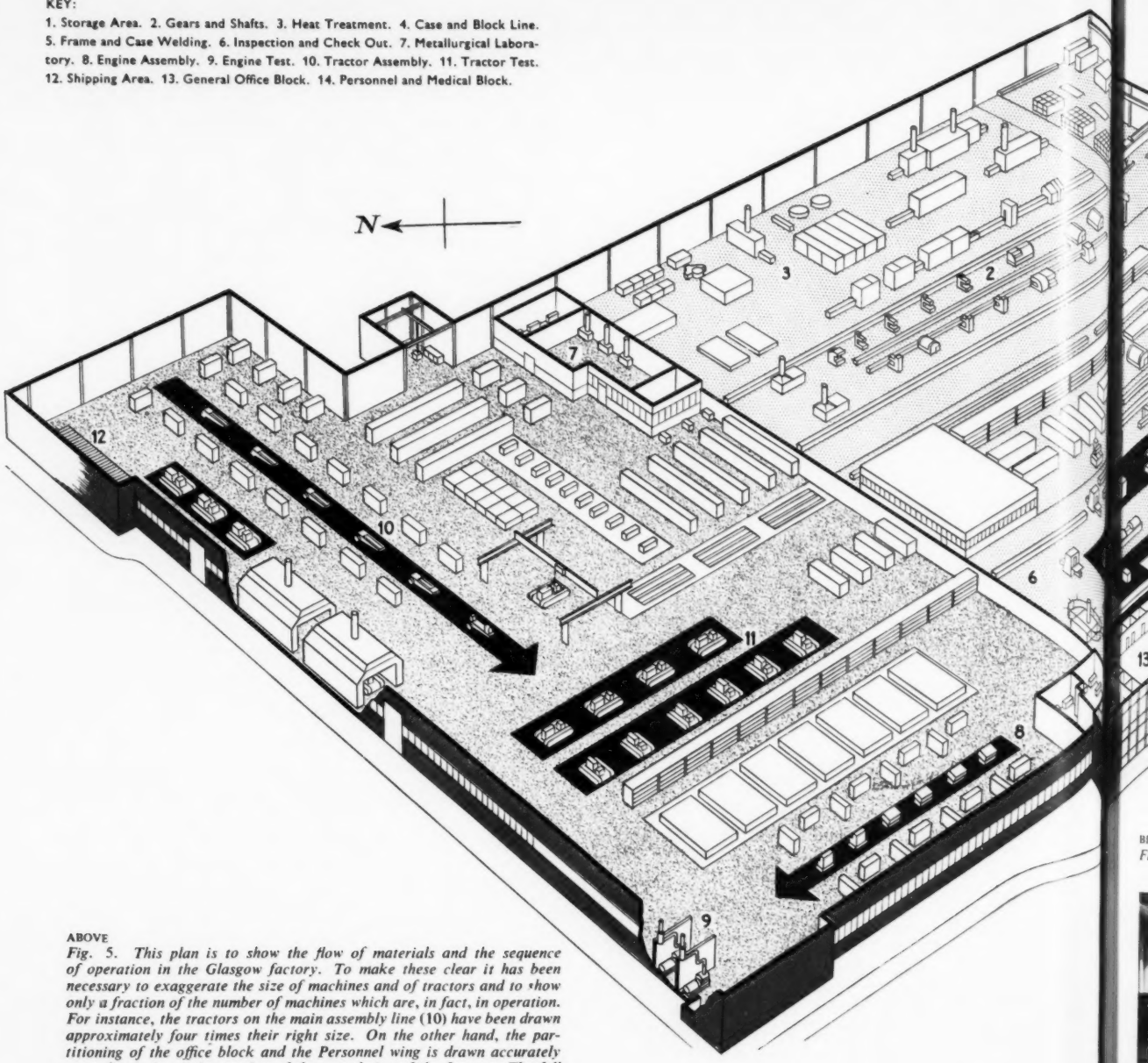


Fig. 3. Main assembly conveyor supplied by Roll Race Conveyors, Ltd.

Fig. 4. One of the machine lines at Glasgow plant typifies the Caterpillar shop floor policy with a strong accent on good housekeeping. Note Aabacas 2-ton electric underhung cranes top left and Thor/Armstrong Whitworth jib-mounted air hoists top right

KEY:
1. Storage Area. 2. Gears and Shafts. 3. Heat Treatment. 4. Case and Block Line. 5. Frame and Case Welding. 6. Inspection and Check Out. 7. Metallurgical Laboratory. 8. Engine Assembly. 9. Engine Test. 10. Tractor Assembly. 11. Tractor Test. 12. Shipping Area. 13. General Office Block. 14. Personnel and Medical Block.



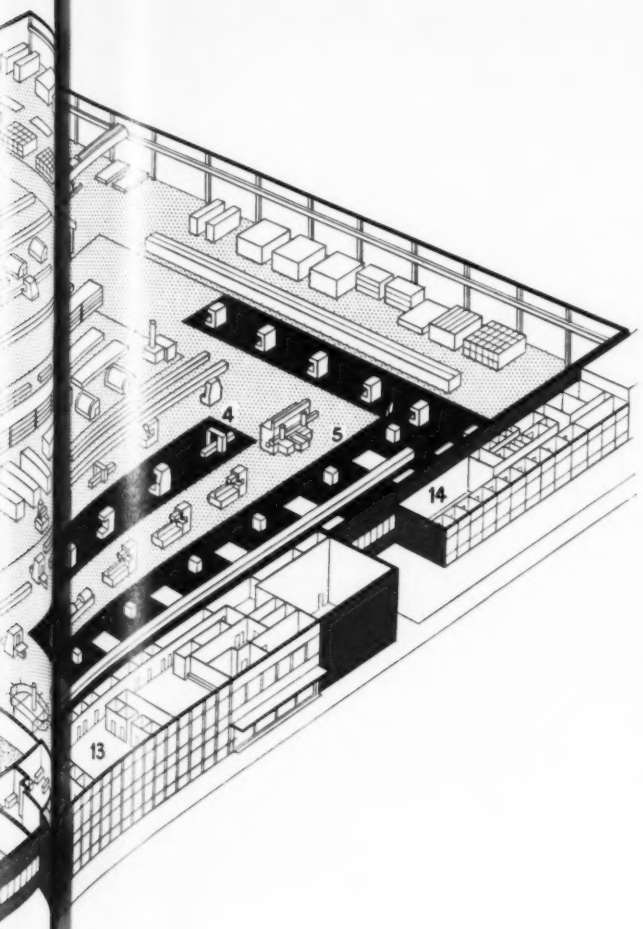
ABOVE
Fig. 5. This plan is to show the flow of materials and the sequence of operation in the Glasgow factory. To make these clear it has been necessary to exaggerate the size of machines and of tractors and to show only a fraction of the number of machines which are, in fact, in operation. For instance, the tractors on the main assembly line (10) have been drawn approximately four times their right size. On the other hand, the partitioning of the office block and the Personnel wing is drawn accurately to scale to give an impression of the actual size of the factory. The full length of the frontage is, in fact, 1,020 ft and the greatest depth 800 ft, giving it an actual floor area under one roof of 13¼ acres

To achieve this the main factory building has been divided into four quarters and a step-down sub-station placed in the centre of each quarter. In order to save floor space these sub-stations have been located overhead in the roof trusses.

Each sub-station contains either two 1,000-kVA or two 2,000-kVA transformers which step down the voltage to the working level of 415 V and a limited 250 V supply. Distribution throughout each quarter is by means of overhead metal-clad busbars rated at 500 amp capacity which run the length of each production bay. Cables are used for the larger items of the plant. In order to give the maximum flexibility in the arrangement for modification of machine tools and equipment, there are plug-in supply units spaced at intervals of 2 ft along the busbars.

The lighting installation provides a level of illumination varying from 20-30 lumens/sq. ft. Except for the high bays, lighting is by means of twin 8-ft 125-W fluorescent tubes.

Before describing the factory it is worth while to appreciate the background concerning the activities of the Caterpillar Tractor Co., Ltd., in Great Britain. In 1950 a British subsidiary, Caterpillar Tractor Co., Ltd., was established at Coalville, near Leicester, to provide British-made Caterpillar parts. Since then the factory has been under continued expansion and now more than 18 million parts are handled annually. The procuring, inspection and distribution of parts is still the responsibility of the Leicester plant. It also provides sub-assemblies for the main product at Glasgow.



In 1956 the activities of Caterpillar were extended by the acquisition of factory premises and manufacturing equipment of the Birtley Co., Ltd., at Newcastle where they had for some time been manufacturing, under licence, bulldozers and scrapers for use with Caterpillar diesel tractors. Manufacture of this equipment continues, the range of equipment covered is being increased and the products of this plant now sell under Caterpillar's own trade-marks and sales and service organization.

Because a strict uniformity of products is considered basic to Caterpillar's world-wide plan of operation and all parts are replicas of those produced in the United States meticulous care in production is necessary to achieve this aim. The Tannochside factory has been equipped with the most up-to-date machine tools plant and inspection equipment, a large proportion being British made, but one of the most impressive features that is first noted in the factory is the remarkable 'housekeeping'. The orderliness and layout throughout is most impressive and must contribute a great deal towards the high quality of the finished product.

At present the plant at Tannochside is making two models of the Caterpillar D8 tractor, one is the 'Direct' drive and the other is the 'Torque convertor'. Next year it is planned to add two more models, the D4, which is the smallest of the tractor line, and the 1955 Traxcavator. To withstand heavy shock loads and arduous conditions which are likely to be experienced under working conditions the D8 needs to have considerable strength and great resilience. It stands over 8 ft high, is 9 ft wide and 17 ft long. It weighs 21 tons and has a ground pressure of 8·7 lb/sq. in. The main feature is the all-welded box-type construction and a unique oscillating bar suspension allows either track to surmount an obstacle while the rest of the tractor remains level. The undercarriage also incorporates lifetime-lubricated rollers and idlers so that no lubrication is necessary during the working life of these parts.

The power unit of the D8 is a 235-h.p. 6-cylinder turbocharged diesel engine which is also made within the Tannochside works. Weighing 6,000 lb it incorporates the

BELOW
Fig. 6. 'S' Bay, at the east elevation of the plant, houses rough stores, steel stores and press shop

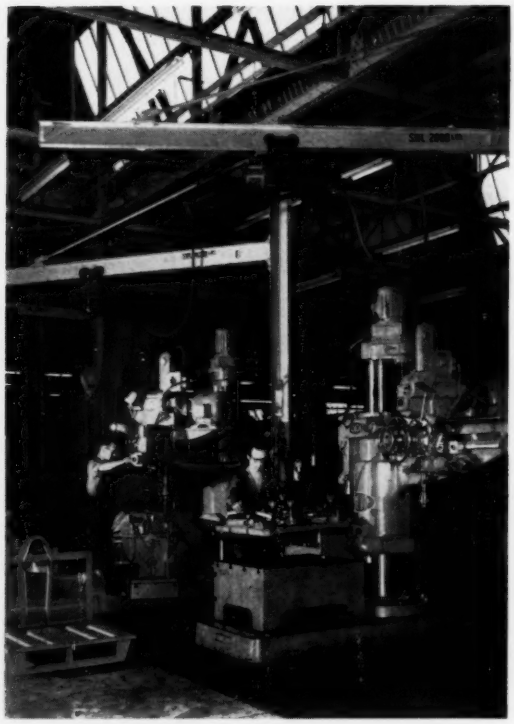


Fig. 7. Deliveries both to home and overseas markets are made from the Glasgow plant of Caterpillar Tractor Co., Ltd. (above)

Fig. 8. 1-ton Globe pneumatic wire rope motor hoist used to lower and accurately position a fixture on a radial drill. In background operator is drilling a tractor component which has been positioned by a 2-ton Globe pneumatic hoist (left)

Fig. 9. A symmetrical pattern of grey-white fibre acoustic tiles and lush fluorescent lighting fittings are features of the 250-ft long ground floor of the general office building. In the foreground are the drafting machines of the Tool Design Section (below)

special Caterpillar feature of a petrol engine starter. Standard on all production models this 2-cylinder starting engine is claimed to offer a reliable start under adverse conditions. The application of a turbo-charger has stepped up engine performance and maintained maximum fuel economy with non-premium fuels.

More than 2,500 different parts are mechanically handled, processed and brought together to form a D8 tractor. One of the methods used to keep check of the flow of material and components through the factory is a large wall-mounted grid board which shows in detail the entire layout of the factory. By reference to this board the location of every machine can be confirmed and the re-location of machines or the setting up of entire lines of production can be planned. A similar system is also applied to office layout.

As can be seen from Fig. 5 production commences from the east end of the building where there is storage for raw materials. Production lines run from this storage area in an east to west direction and continue for about half the length of the building. On the north side is located the heat treatment shop complete with its own inspection and check-out. Next comes a line for the machining and finishing of gears and shafts and alongside this runs another line of machines for the production of miscellaneous parts. Extending across the ends of these three lines is a final inspection and check-out section so positioned that components are fed direct into this area as they are produced from the machines.

Running down approximately the centre of the main building, still from east to west and parallel with the main production lines, are the tool room sections with their associated stores and the factory office. On the

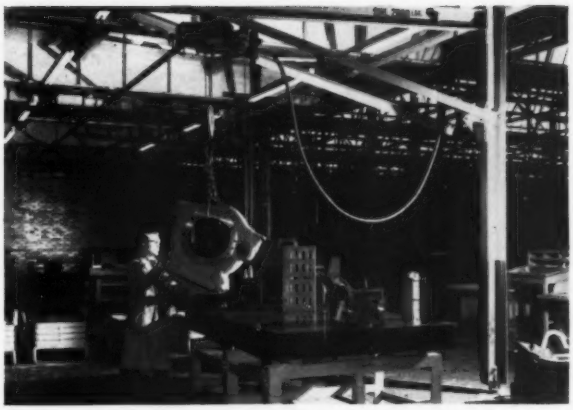


Fig. 10 (top). 1-ton Globe Pneumatic wire rope motor hoist used for surface table work

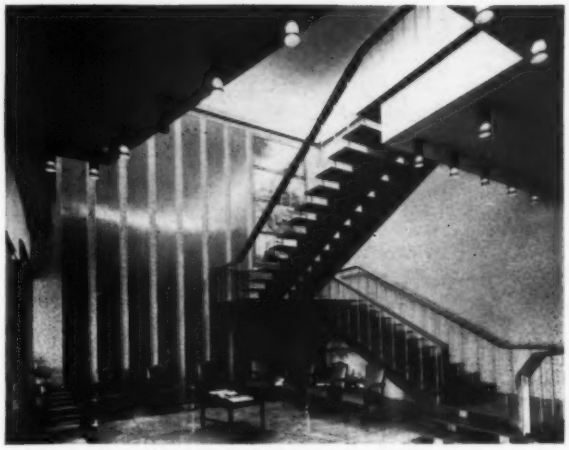
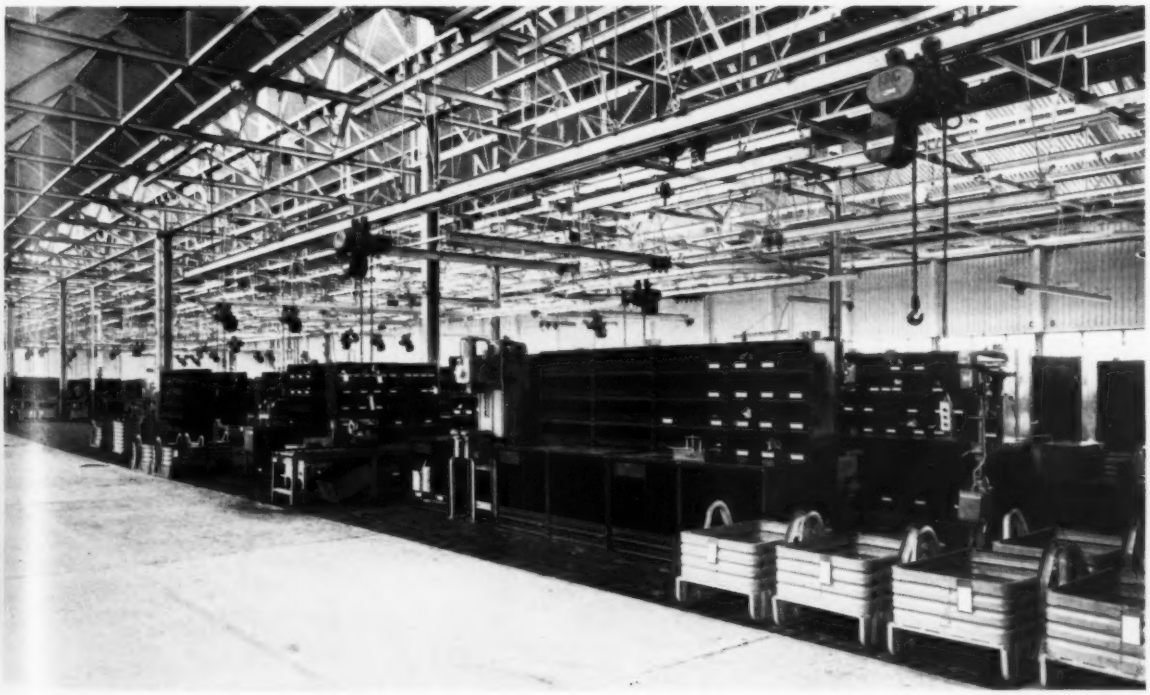


Fig. 11 (centre). The main entrance hall of the Glasgow plant

Fig. 12. An installation of 19 King Marvex hoists running on Supertrack Runways



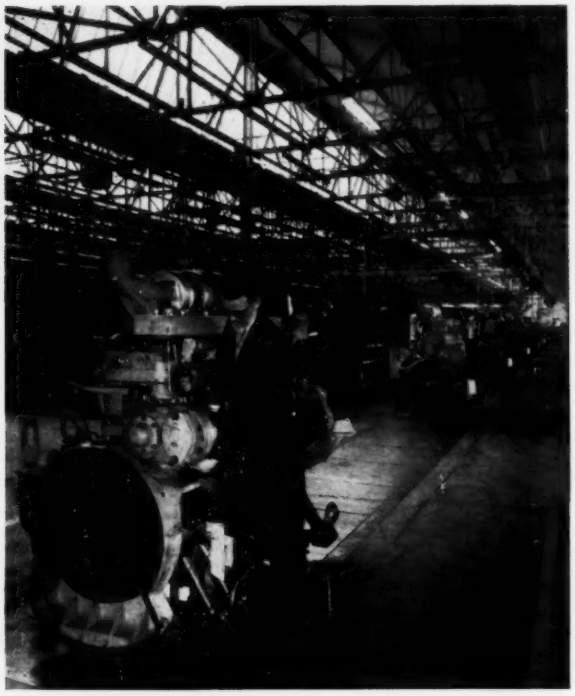


Fig. 15. *The 235-h.p. diesel engine nears completion on the motorized assembly conveyor*

Fig. 13 (*above*). *Typical example of the Thor/Armstrong Whitworth safety balancer used for tools and other equipment*

Fig. 14. *Thor/Armstrong Whitworth* 2,000-*lb capacity air motor safety hoists of the type used in the factory*

south side of this area there are more production lines, starting with one for miscellaneous large parts, then for gear cases and engine blocks, followed by a miscellaneous welding area. Frame and case welding follow, and finally, alongside the east side, welding expansion. Final inspection runs at right angles to all these remaining production lines so that parts produced are passed directly for inspection.

Following on down the main factory building towards the west end and beyond the final inspection departments are located the metallurgical laboratories, gear laboratory, salvage area, and storage for finished parts, engines, tracks and other items. Beyond these various departments located on the south side is the engine assembly, this being carried out on a slatted conveyor at floor level, which is 264 ft long by 3 ft 6 in wide. It is designed for a unit load of up to 3 tons, a total load of 55 tons and has an infinitely variable speed of from 6 in up to 24 in per minute. At the end of this conveyor the complete engines are transferred direct into the engine test bays.

From the assembly line every diesel engine is lifted into muffled test beds, where it is dynamometer tested under varying work loads for 4 hours. Fuel consumption, water and oil temperatures, cylinder head pressure, etc., are

Fig. 16. *The tractor frame is fitted to the track roller frames*

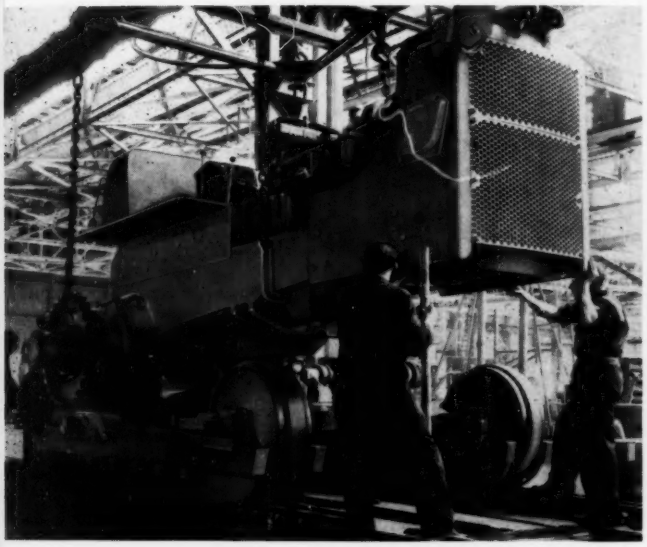


Fig. 17. *Every D8 crawler tractor runs for* 1½ *hours on oiled steel skid test plates*

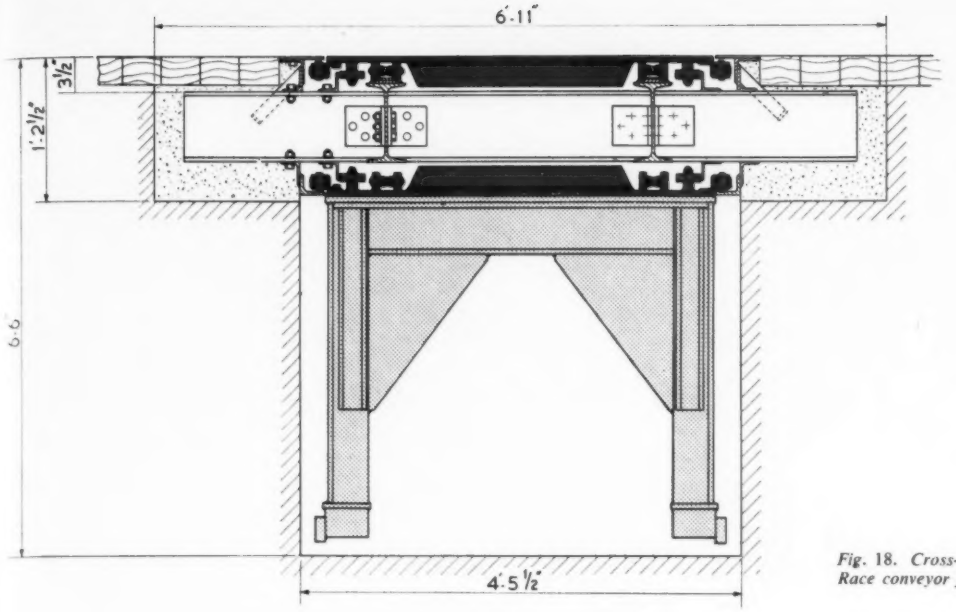


Fig. 18. Cross-section of the Roll Race conveyor for tractor assembly

Fig. 19 (below). Final welding operations on the gear case and box-type main frame of the D8 tractor

measured and recorded. A regular proportion of these engines chosen at random is given a more intensive test. They are then stripped, inspected and rebuilt.

Tractor assembly starts from the north-east corner and runs across the main building parallel to the west wall. A slat conveyor 370 ft long by 4 ft wide runs throughout the assembly bay. This conveyor is designed for a unit load up to 20 tons and a total load of 170 tons. Speed is infinitely variable from 6 in up to 24 in per minute.

Component parts, sub-assemblies and other items are fed to the main tractor assembly conveyor along aisles running at right-angles to the conveyor. The smaller items are held in bins located near to the point where they will be required for assembly on the tractor, while heavy items are brought direct to the conveyor by motorized overhead conveyors or fork lift trucks, as they are required. The timing of the arrival of items so that they are at the right position on the main conveyor at the right time needs very careful planning indeed. Its successful operation, however, does result in an assembly area that is kept perfectly clear of all items except those that are actually required 'on the job'. This is also a great asset to the fitters who have ample space in which to work and are completely unencumbered by any equipment or tools except that which is required for their immediate needs. The advantages of this method of working can be appreciated by reference to the illustrations in this article.

At the final stage of assembly the tractor is lifted by an overhead gantry crane and positioned on its undercarriage resting on a fixed track. The engine is started up and the tractor driven forward on to its own tracks.

As soon as the tractor is complete and has its undercarriage and tracks installed it is transferred to a 'skid pan' for test. Here it is anchored to a steel bar and its tracks located on two oiled steel plates. The tractor is then run on these plates while steering, clutches and brakes are tested, and other operating adjustments made. After running tests and final adjustment the tractors are transferred to booths where they are prepared and sprayed in the familiar yellow, applied to all Caterpillar equipment.

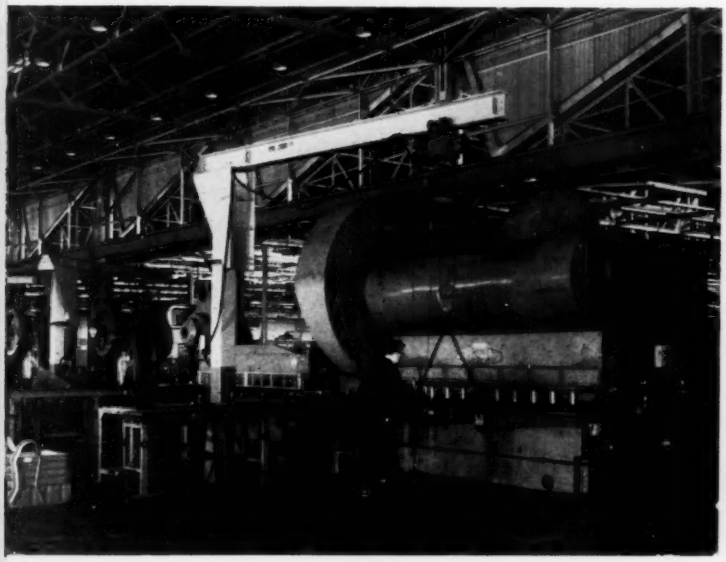
Fig. 20. View of a machine-shop line showing a battery of jib-mounted ½- and 1-ton Globe pneumatic wire rope motor hoists

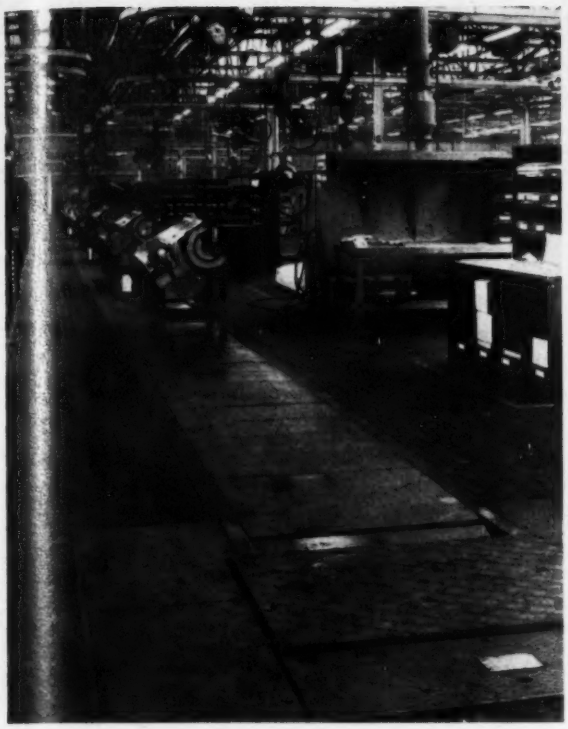
Fig. 21. *Fitting tracks to the tractor (above)*

Fig. 22. *1-ton Globe pneumatic wire rope motor hoist used on a jib crane for lifting steel plates into a guillotine*

Fig. 23 (*right*). *Setting the programme timers to control the process cycle of the pit-type gas carburising furnaces, part of one of what is claimed as the largest and most modern heat treatment lines in the U.K.*

Except for the slat-type conveyors used for engine assembly and final tractor assembly as mentioned above, and roller-type conveyors used in conjunction with the production lines, most of the mechanical handling used for transferring larger items from machine to machine, or to assembly, is by overhead crane or hoists, movement from stores to assembly is usually by fork lift truck. Both air-controlled and electric hoists are used mounted either on overhead track or jibs as the occasion demands. Numerous slings and cradles of special design to suit the many items produced in this factory are in use. A form of skid bin, used for transporting small items and which is designed so that it can be handled by either a fork lift truck or overhead crane, has been standardized for use throughout the factory.

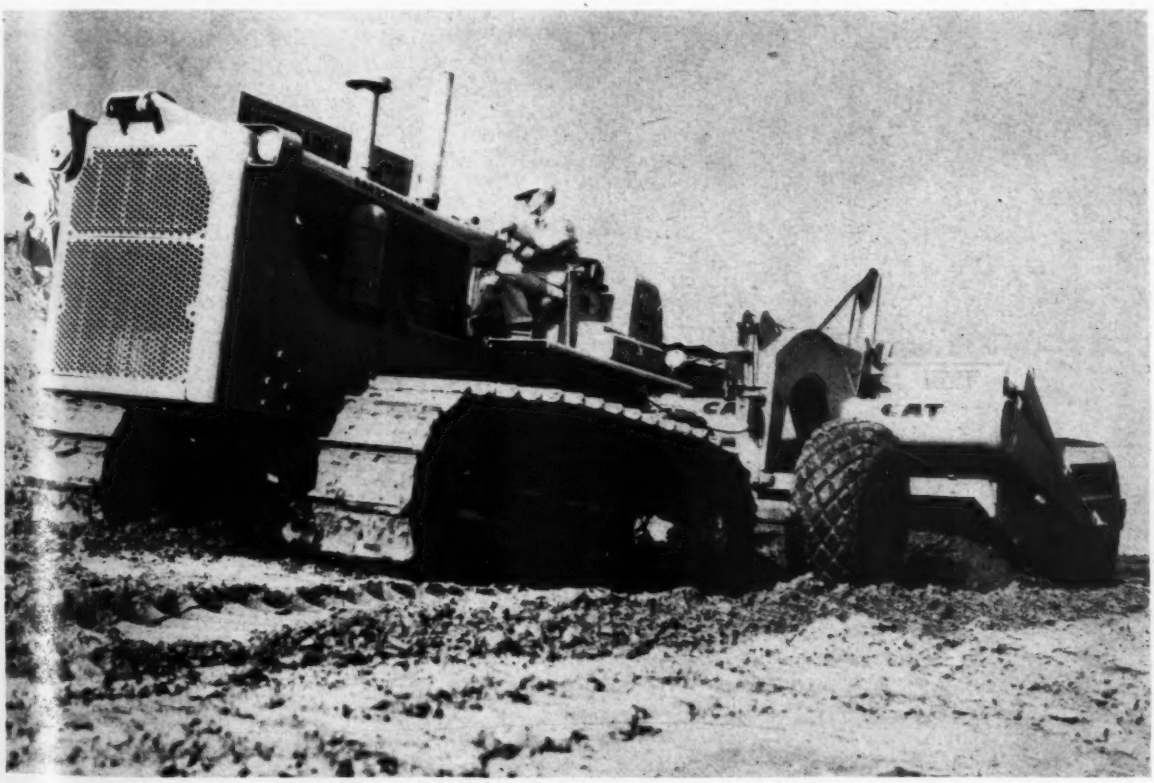




ABOVE
Fig. 24. View of the Roll Race conveyor for engine assembly

Among the many firms engaged in the construction and equipping of the Caterpillar factory were the following: **Consultants:** Hamilton and Associated Consultants. **Compressors:** Bellis & Morcome; **Site Preparation Contract:** John Laing & Son, Ltd.; **Cranes:** J. H. Carruthers, Ltd.; **Boilers:** John Thompson (Wilson Boilers), Ltd.; **Electrical Equipment:** Bruce Peebles & Co., Ltd.; J. G. Statter & Co., Ltd.; and The English Electric Co., Ltd., **Steelwork:** P. & W. McLellan, Ltd.; Fleming Bros.; Donald Clerk & Son, Ltd.; and Redpath Brown & Co.; **Electrical Switchgear:** Ferguson Pailin, Ltd.; **Lifts:** Waygood Otis, Ltd.; **Pumps:** Sulzer Bros. (London), Ltd.; **Switchgear:** The Belmos Co., Ltd.; **Water Tank:** The Motherwell Bridge & Eng. Co., Ltd.; **Lighting Fittings:** The General Electric Co., Ltd.; and A. E. L. Lamp & Lighting Co., Ltd.; **Electrical Installations:** James Scott & Co., Ltd.; **Valves:** Glenfield & Kennedy, Ltd.; Audley Engineering Co., Ltd.; The Magnetic Valve, Ltd.; and Crane, Ltd.; **Propane Gas Installation:** H. E. Charlton Engineers, Ltd.; **Overhead Crane Installations:** Aabacas Eng. Co., Ltd.; **Air Hoists:** Armstrong Whitworth & Co., Ltd.; and Globe Pneumatic Eng. Co., Ltd.; **Steam Wash Booth, Paint Spray Plant,** and **Yellow Seal Plant:** Heat & Air Systems, Ltd.; **Engine Test Bed Equipment:** Heenan & Froude, Ltd.; **Tractor & Engine Assembly; Overhead Crane Installation:** Geo. W. King, Ltd., **Degreasing Tank:** Maitlands, Ltd.; **Surface Treatment Tanks:** McCall Munro & Co., Ltd., **Roller Conveyor Equipment:** Metalrax Conveyors, Ltd.; **Engine Assembly & Tractor Assembly Slat Conveyor Equipment:** Roll Race Conveyors, Ltd.; **Tubes, Skids and Tiering Racks:** T.P.S. Products, Ltd.; **Steel Shelving & Binning:** Watson's Business Equipment, Ltd.

BELOW
Fig. 25. A Glasgow-built Caterpillar D8 crawler tractor pulls a No. 463 scraper, manufactured at Caterpillar Tractor Co., Ltd.'s Newcastle plant



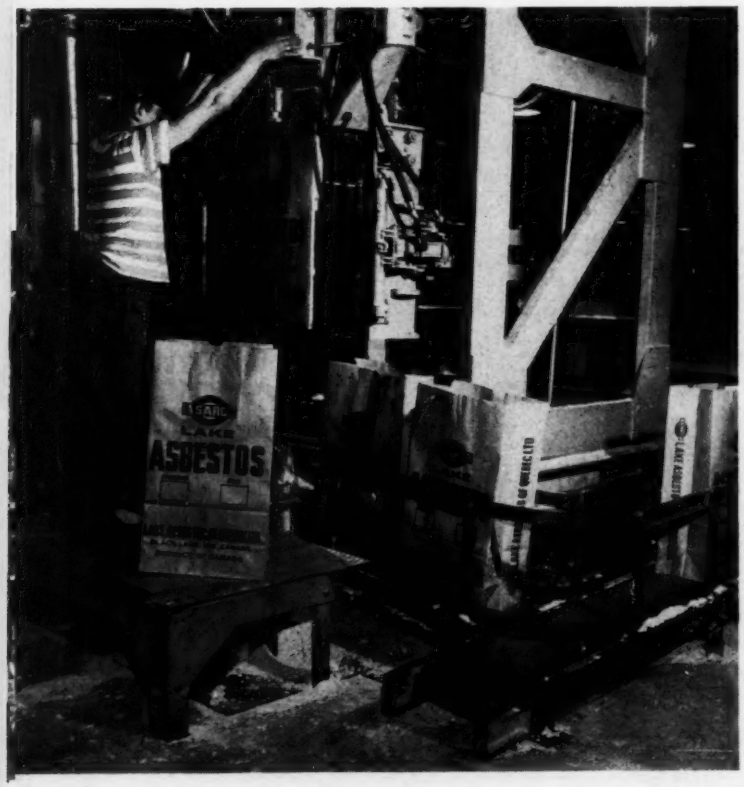
Handling Equipment at New Canadian Asbestos Plant

By John Grindrod, B.A.(Com.).

ABOUT THREE MILES of conveyor belting and five miles of aspiration lines and chutes have been installed in a new $9.2-million asbestos mill belonging to Lake Asbestos of Quebec, Ltd., a subsidiary of American Smelting & Refining Company, at Black Lake, Quebec, Canada. The mill itself is part of a $36-million project which has involved the draining of the 500 acres of water from the Black Lake and the removal of the mud, silt and rock lake bottom which overlay the rich asbestos deposit so that the mineral could be extracted by opencast mining methods.

Comprising the main building at Black Lake, the mill is 150 ft wide by 260 ft long (including the drier section) and 130 ft high. As tall as a 14-storey building, it is entirely enclosed. Some of the significant features incorporated in the new Lake Asbestos mill design and processing are: outdoor stockpiles of undried ore; three stages of crushing, drying, milling and finished fibre warehousing all in the same building; filtering of dust from the drier exhaust; automatic remote control of the mill feed; multi-stage fibreizers; multi-stage graders; and special techniques for removal of wood from the mill flow.

Fig. 1. Pressure-type packing is used to fill paper bags with asbestos at the Black Lake plant



The primary function of the 5,000 tons of ore per day mill is to separate the asbestos fibre from its host serpentine rock. Since this is accomplished by repeated crushing, fibreizing, removing free fibre by suction and screening the freed fibres to remove rock and dust a vast system of conveyor belts and ductwork is required.

Ore from the mine is dumped into a 100-ton chute in the primary crusher building whence it is fed by a Stephens-Adamson heavy-duty pan feeder, 18 ft long by 60 in wide, to a Taylor jaw crusher set at 6½ in opening. This primary crusher has 48 × 60-in jaws and can handle ton-size rocks, crushing the ore to a maximum chunk size of about 6 in.

From the jaw crusher the ore is conveyed by a 42-in wide rubber-covered conveyor belt to the top of a screen house which contains two 5 × 12-ft Tyler vibrating screens with openings equivalent to 4 × 4 in square. The oversized ore is returned by belt conveyor to a 7-ft Symons cone gyratory crusher while the undersize is conveyed by a long conveyor belt to an outdoor wet rock stockpile, which has a normal capacity of 120,000 tons, or about one month's run of mill. This outdoor wet stockpile permits blending of the ore from the two ore bodies from which it is mined, provides for a steady supply of ore for the mill in case major repairs are scheduled for primary crushing or mining equipment and feeds the driers at a constant tonnage of 24 hours a day.

A conveyor belt, fed by automatically controlled feeders located in the recovery tunnel under the wet rock storage, supplies the ore to the driers. At the head of the drying department ore is separated into plus and minus 2 × 2-in mesh. The coarse material is by-passed around the driers except when the ore is extremely wet or contains an abnormal amount of snow or ice. The rock is dried in rotary, oil-burning driers, in which temperature conditions are varied in keeping with the moisture content of the rock and to which it is cascaded down through chutes from the conveyor system.

After drying, the ore goes to two 5 × 12-ft Tyler vibrating screens of ¾ × ¾-in mesh. The plus material goes to a 5½-ft cone crusher (a second 5½-ft cone crusher is to be added soon), while the minus material goes by a long conveyor belt to the far reaches of a 20,000-ton dried ore covered storage bin. From a tunnel under the dry rock storage the dried ore is fed by automatically controlled vibrating feeders to the mill.

Here, in the mill, the predominant process is air separation of the fibre. Dry crushed ore is fed to heavy shaking screens equipped with powerful air suction hoods. The shaking action screens out sand, and, as the ore moves along, the fibre rises through the rock fragments and is removed by suction as it passes under the hood. The openings in these screens are kept from blinding by rubber balls under the screening surface. These bounce against the underside of the

screen or perforated plate. Aspiration from the screens is accomplished by exhausting air from the top of cyclone collectors through a bag filter chamber at the top of the mill. Air is exhausted from this chamber by six 350-h.p. high-efficiency-type fans. The clean air is returned to the mill, or to the outdoors, through adjustable louvres.

At the head of the mill, the ore is fed to three identical rock lines by a blending surge bin equipped with Hardings constant-weight feeders. From the first vibrating screen the rock goes to a further crushing stage where a Hazemag machine breaks down the ore to about ½-in pieces. Then it is again passed over a shaking screen equipped with suction hood to remove the fibre. Finally, the rock from this screening is fed, together with smaller material from the initial rock screening, to a fibreizer, which breaks the rock by the impact of high-speed hammers. It has a more severe action than the crusher, which breaks the rock by compression. Because of this, the fibreizer is not used until the longer, more valuable fibres have been removed. Again, the resultant ore is fed to shaking screens where the fibre is separated by suction.

Cleaning and grading of the asbestos is accomplished by feeding the fibres to cyclone collectors. The heavier fractions, comprising rock particles and unopened fibres, fall vertically while suction air draws the lighter asbestos fibres off sideways to be graded according to length by passing through flat or rotary screens.

The grading screens have three sections, each of which is covered with a wire cloth of a different mesh. Fibres fed into one end of the screen are agitated by revolving paddles which force the short lengths through the screen of the first section and eject the longest grades at the end. Each grade falls on a flat cleaning screen where sand, dust and unmilled splinters are removed.

Fig. 2. Fibre flow being regulated at the bases of the cyclone separators where the desired fibres settle out and undesirable dust whirls out at the top en route to the bag filters

Fig. 3. Conveyor belt carrying dried asbestos ore to the far reaches of the huge enclosed dry ore storage building

Waste from all the screening operations, which is normally about 90 per cent of the original ore, is conveyed by belt conveyor to a tailings dump. One of the unique features of the Lake Asbestos mill design is that approximately 35 per cent of the original feed can be rejected to tailings after the third screening operation. This relieves the third and fourth stage milling machines of a considerable load and minimizes sand, dust and rock powder.

After blending in the graders, the fibre is screened and lifted into cyclone collectors which discharge into finished fibre bins, of which there are 14 in all, and into which such grades as spinning, shingle, paper, stucco and plaster and shorts are collected.

From these bins, the bottoms of which are equipped with six spiral screws, material is automatically fed to five pressure packers (eventually eight), four St. Regis and four vertical-screw packers for bagging. Subsequently, it is transported to warehouse, railway wagons or trucks.

Altogether, 630 electric motors are used in the Black Lake plant and the total installed horsepower in the mill is 7,000. Mill operations at 5/6,000 tons of ore per 24 hours use approximately 800,000 ft³ of air per minute in the mill and 180,000 ft³ of air per minute in the drying building. The mill was constructed by the F. H. McGraw Co., of Canada, Ltd.

HANDLING WITH INDUSTRIAL TRUCKS

This is the first instalment of a series of articles dealing with all types of industrial trucks ranging from hand trucks to straddle carriers, and the important part they play in materials handling.

By L. J. Hoefkens, A.I.Prod.E.

THIS SERIES OF articles has been written with three objects in mind, firstly to gather together all possible information on the subject of industrial trucks as used in the United Kingdom, secondly to act as a guide to present and future users, and lastly to enable a user to acquire a good understanding of their application in industry and how to derive the maximum benefit from their acquisition.

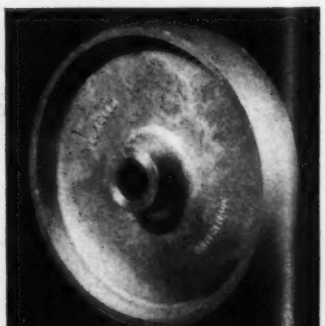
The author acknowledges with grateful thanks the assistance of many companies who have supplied specifications, technical data and illustrations, and whilst every endeavour has been made to make these articles as comprehensive as possible, nevertheless developments are continually taking place in the field of Materials Handling so that it is recommended that a would-be purchaser should, apart from using them as a guide, also consult makers of equipment to ensure that he is right up to date before embarking on any particular project. Also, as it is impossible to illustrate every item, it should be taken that those shown give a broad impression of what is on the market.

The basis of all industrial trucks is the wheel: a device, the inventor of which is lost in antiquity. We can, however, imagine that it did not take long after its discovery for the first truck to appear and it has been with mankind ever since. However, probably the greatest period of development has been during the last 20 years with the advent of the fork lift truck, straddle carrier and the mechanical shovel. As stated previously, developments are continually taking place and we have to-day numerous fork lift truck attachments, as will be described later on, and trucks of ever-increasing capacity. The versatility of the human hand has been copied so that trucks are now able to grasp a load, raise it, lower it, manipulate it and release it, all at the touch of a lever. Never satisfied with our achievements, robot trucks operated by remote control and guided by their own built-in 'sensing-coils' can travel about a factory without human intervention.

Fig. 1. *Flexello Castors & Wheels, Ltd.: (a) black polished plastic castor wheel; (b) medium-duty cushion-tyre wheel; (c) cast aluminium bronze bush wheel used where non-sparking is important; (d) solid rubber soft tread castor wheel; (e) ball-bearing pressed steel industrial castor wheel; (f) a pressed steel stationary industrial wheel*


1a


1b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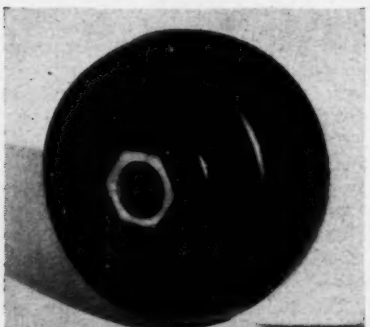
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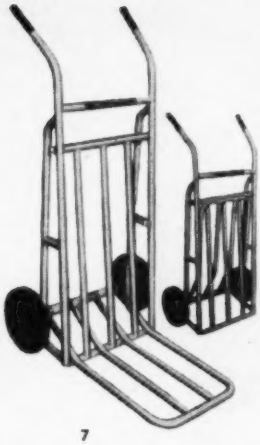
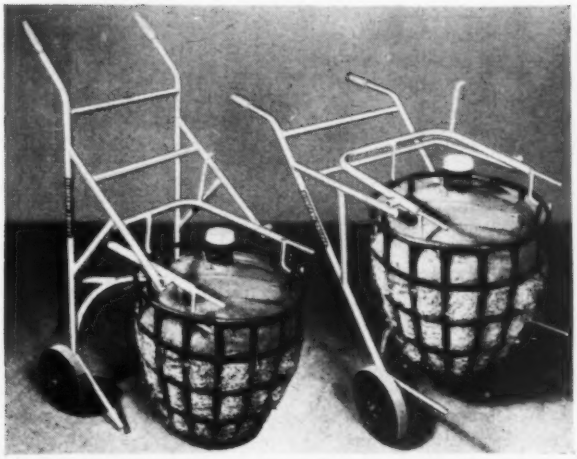


7

3

Fig. 2. A modern design of sack truck by Willmott Trucks, Ltd.
Fig. 3. Special 'Powell' two-wheeled drum-carrying truck
Fig. 4. Two-wheeled carboy carrying truck by Slingsby
Fig. 5. Slingsby special two-wheeled brick clamping truck
Fig. 6. Special two-wheeled wire-coil-carrying truck, Slingsby
Fig. 7. Two-wheeled Slingsby sack truck with folding foot iron

6



4

Much controversy has at times raged as to their rightful place in industry, and this particularly applied when the fork lift truck came along and in certain instances ousted an existing conveyor system.

With the development of the practice of Work Study and a more scientific approach to the problems of materials handling and the economic aspects of this subject, it is now generally accepted that where the movement of materials is of an intermittent nature then the industrial truck is the right tool for the job, but where there is continuity of flow between fixed points then the conveyor should be used. One should, however, beware of generalization on any of these matters because there must be many exceptions, such as the old type of building with many floor levels where trucks could not reasonably be expected to operate, and the only possible solution could be to make use of some form of conveyor system, be it perhaps only a simple gravity chute.

It is only in this century that the subject of materials handling has received serious and concentrated study. The need has been created no doubt by the growth of mass production. This method of manufacture brought with it problems of handling and storing ever-increasing quantities of raw, semi-finished and finished goods and materials; problems which had to be solved in order to overcome congestion, to prevent damage and to maintain the flow of work demanded by the new production processes.

During the two world wars, due to depletion of man power coupled with the demand for larger and larger quantities of materials from the factories to support the armies in the field, man's ingenuity again had to turn to improved materials handling as a contribution to the solution of these problems. All too well remembered are the bulldozer clearing the jungle to create airstrips or disposing of rubble after air-raids on our towns and cities and the development of agricultural machinery to release farm labourers to the forces and to beat the enemy blockade. Since the war economic conditions in the world have demanded from us higher productivity in order that this nation may compete in the world markets, and once again it was realized that an important contribution could be made by better materials handling both in industry and transportation. This incentive

Fig. 8. Two-wheeled semi-live platform tugbar handle in position for manual towing, Willmott Trucks, Ltd.

of self-preservation, be it national or individual, both in peace time or time of war, gives a continual impetus to the study and development of material handling techniques and improved and novel mechanical handling equipment, constantly sees the light of day. No industrial concern, large or small, can afford to ignore these facts. Competition either for markets or for labour will eventually compel the non-progressive firm to modernize. It should not be overlooked that in times of full employment labour will become more and more reluctant to undertake dirty, heavy or dangerous manual work when machines and better methods exist which eliminate these out-of-date working conditions.

In industries such as road-building, warehousing, gravel pits, etc., where the handling of materials is a large proportion of their activities, the manner in which handling is performed is, no doubt, a major factor in their success and survival.

Industrial trucks of all types and capacities play a most important role in almost every industry. Their flexibility of movement, scope of application and ability to work with other handling equipment such as cranes and conveyors to form an integrated system, give them great importance in the sphere of materials handling.

In these articles the basic types of industrial trucks will be described and sections are included on how to use them with efficiency and safety. Many illustrations have been provided by equipment manufacturers and due acknowledgment is made to them for their kind and willing co-operation.

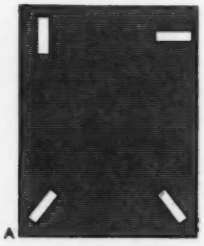
The enormous variety of trucks in existence, made up of many basic types, is continually being added to by designers creating ingenious adaptations for special purposes or by making hybrid types; that is, combining in one truck the best features of two basic types. For these reasons their classification has had to receive careful thought. It has been customary to group trucks under two main headings, namely manually operated trucks and power-operated trucks. However, it is now found that some manually operated trucks are being produced which are partly power operated. There appears to be only one main demarcation line left and that is the one which has been used in these articles, namely a broad grouping according to method of propulsion, i.e. manually or by power. The power-propelled trucks then fall into two main sub-divisions; pedestrian controlled and rider controlled.

Fig. 9. Powell special purpose three-wheeled tipping truck for carrying swarf, refuse, clinker, waste, etc. Capacity 12 ft³

1. Industrial Trucks: Types and Classifications

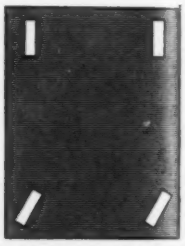
Of all handling equipment, floor handling equipment and notably industrial trucks comprise the largest group, no doubt because of their great flexibility, and in some cases because of the small capital outlay required relative to their value in industry.

Industrial trucks can be divided into two major groupings, namely, manually propelled trucks and power-propelled trucks. Power-propelled trucks fall again into two main groups: pedestrian controlled and rider controlled.



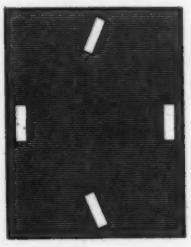
A

Four swivel castors give maximum manoeuvrability but not suitable for long-distance travel.



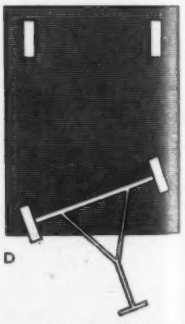
B

Two stationary wheels and two swivel castors give easy handling and better control. Pushing or pulling is from the swivel end.



C

Two stationary wheels in centre packed up to raise end castors off the ground slightly. Good manoeuvrability. Pushing or pulling from either end. Sometimes end wheels are plain non-swivelling type and slide from side to side on an axle.



D

Two stationary wheels. Two wheels fitted to a common axle pivoted on a fifth wheel. Pushing or pulling from pivoted end.

Fig. 10. Popular wheel arrangements for four-wheeled trailer

Fig. 11. Slingsby four-wheeled warehouse truck with four swivel castors for 'order picking'

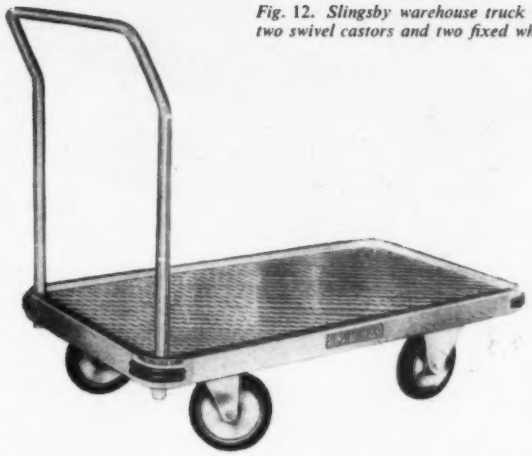


Fig. 12. Slingsby warehouse truck with two swivel castors and two fixed wheels

Manually Propelled Trucks

1. Two-wheeled.
2. Three-wheeled
3. Four-wheeled (*a*) castor steering (*b*) turntable steering.
4. Lift-trucks, platform type.
5. Lift-trucks, pallet type.
6. Dollies or bogies.
7. Special-purpose trucks.

Power-propelled Trucks

1. *Pedestrian-controlled trucks*
   - (*a*) Pallet.
   - (*b*) Platform.
   - (*c*) Fork lift: (1) counterbalanced type; (2) outrigger type.
2. *Rider-controlled trucks*
   - (*a*) Platform.
   - (*b*) Pallet.
   - (*c*) Fork lift: (1) counterbalanced type; (2) outrigger type; (3) reach type.
   - (*d*) Tractors.
   - (*e*) Straddle.
   - (*f*) Side-loading and side-carrier.

One of the most important components and one which is common to all trucks is the wheel. It is a materials handling device of the greatest significance, yet we do not know when it was first discovered nor by whom. A debt is owed by mankind to its inventor that cannot be paid in royalties; its existence is often taken for granted and its importance goes unappreciated by many.

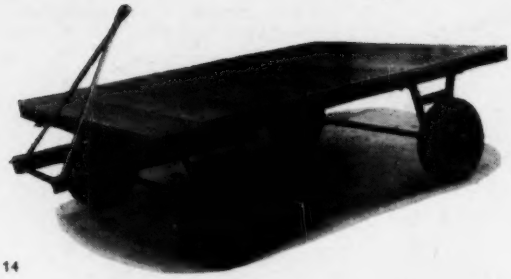
The material handling engineer, of all people, should understand the fundamentals of wheel design, the many types available and the correct use to which they should be put. The wheel is no exception and in common with other materials handling equipment developments are continually taking place and finality has not been reached in its design and the materials from which it is constructed. In dealing with wheels mention must also be made of the castor which is a pivoted wheel, sometimes using ball or roller bearings to reduce friction, giving increased manœuvrability to trucks of all kinds.

In giving consideration to the correct type of wheel to employ, such factors should have attention: (*a*) the load which will be imposed upon it; (*b*) the conditions under which it will have to operate; (*c*) the material from which it is to be made.

Fig. 13. Parcels truck with two fixed wheels and two sliding wheels, Slingsby

The material from which the wheel is made has a direct relationship to the load capacity. Cast-iron wheels for instance are the least expensive, they will support considerable loads, but they are noisy in use, cause rapid wear of concrete floors and are not desirable for use on rough outside roadways. Rubber-tyred wheels, whether solid, moulded cushion or pneumatic, will all carry varying loads. They are quieter in operation, cause less wear to the floors, but have a greater friction in relation to the floor surface. This is important where manual trucks are concerned and if a rubber tyre is essential then one with the largest possible diameter should be selected and fitted with good roller bearings so as to reduce the human effort to a minimum.

With the introduction of fork lift trucks of the straddle and reach type, enabling gangways to be made considerably narrower than was previously possible, floor wear can become quite a serious problem because these trucks, especially the straddle type, are fitted with small-diameter wheels. Because of the narrow gangways, little wider than the truck itself, the wheels each carrying a considerable load are permanently travelling over the same path. The sharp right-angle turn made by the truck pivoting on one wheel together with the wear caused by the truck moving over the same track causes rapid wear of the floor and of the wheels themselves. Alternative materials such as



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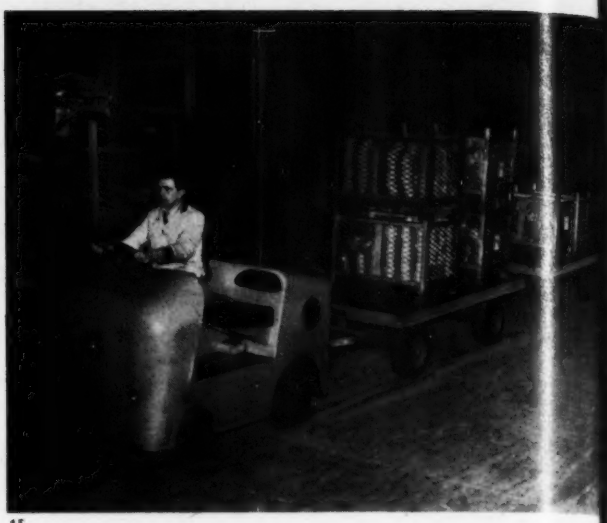

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Fig. 14. *A Willmott four-wheeled trailer with turntable steering. Large-diameter pneumatic tyres*

Fig. 15. *Heavy-duty trailers being towed by an electric tractor unit. Transportation of palletized loads in a large factory, by Lansing Bagnall, Ltd.*

Tufnol and *Nylon* have been tried, but have not proved satisfactory in all applications. However, a new plastic has been brought on the market named *Duthane* from which these wheels can now be made. The claims made for it are that it outwears rubber several times, that its load capacity is two or three times greater than rubber and that it reduces power consumption considerably. Certainly first tests bear out these claims that both concrete floor and tyre wear is considerably reduced and consequently the dust problem in stores. The materials handling engineer has all these factors to consider when determining the type of wheel to specify on a particular piece of handling equipment. The most important of them all is to remember that the larger the wheel diameter for a given load the easier it will be to move it and that the wider the wheel face the heavier the load it will support.

Castors are wheels mounted in a fork and usually run on a roller or needle bearing. Because the wheel centre is offset from the vertical it has a swivelling action. Combinations of castor wheels and fixed wheels are used to obtain varying degrees of manuœvrability.

Manually Propelled Trucks

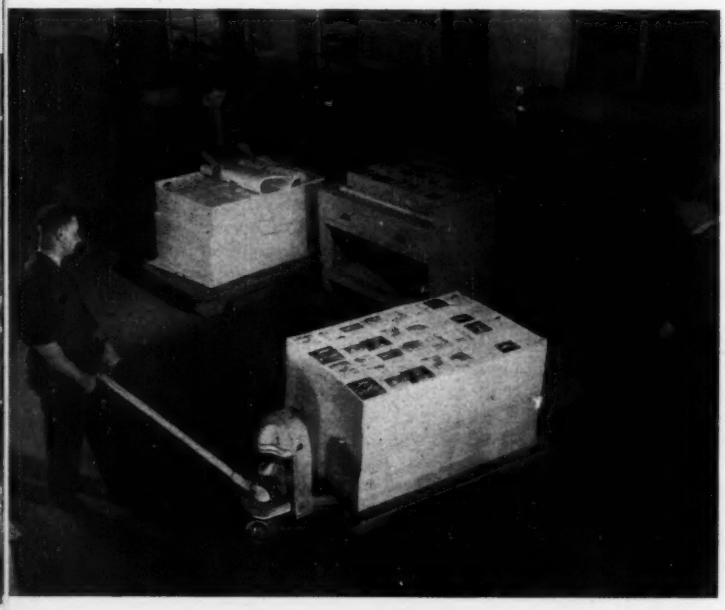
Two-wheeled trucks

The most popular and universally used two-wheeled truck is known as the 'sack truck'. They can be seen in every railway station and warehouse for moving numerous types of loads over short distances. There are very many special and ingenious adaptations of this piece of equipment for handling special loads such as oil drums, chemical carboys, rolls of paper or lino, cylinders of gas, etc.

Fig. 16. 10-*cwt capacity platform-type lift truck, by Eccles (B'ham), Ltd.*

Fig. 17. *Yale & Towne platform-type lift truck,* 3,500 *lb capacity, handling a load of printed matter on a wooden platform*

Fig. 18. *A typical example of a manually-propelled and operated hydraulic lifting pallet truck, Industrial Truck Development, Ltd.*



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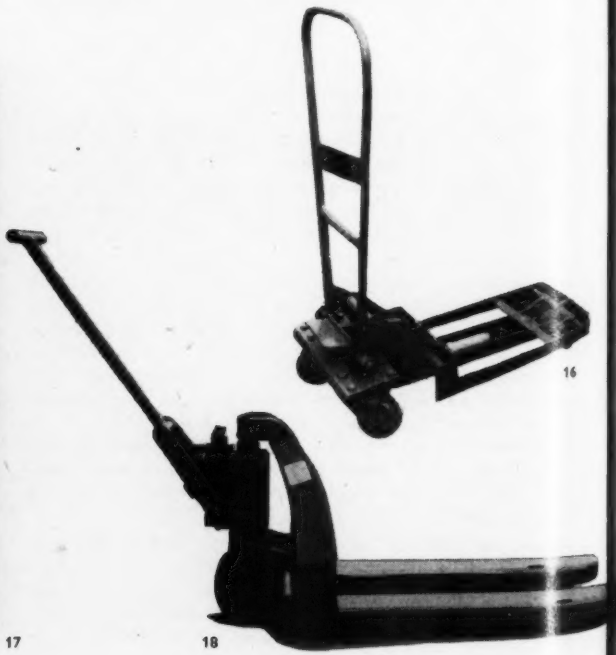

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A special type of two-wheel truck and one which has many points in its favour is the semi-live platform truck used in conjunction with what is known as a 'tugbar' handle. Its commonest form is a wooden platform or box truck fitted at one end with two fixed wheels and with two legs or 'steadies' at the other end. Midway between the two legs is a special fitting, a socket cap into which can be fitted a towing and steering handle provided with two wheels close together and a ball socket. This means that for such trucks only two wheels are necessary instead of four and when in rest the truck cannot move as it is on two feet as well as the two wheels. When it is required to move it, the 'tug lift' bar is brought to the truck, the socket is inserted into the cup and the handle depressed. This lever action raises the legs from the floor and makes the truck mobile and very manœuvrable. Only one tugbar is necessary to serve a quantity of trucks.

Three-wheeled trucks

These trucks are usually of the platform type with two fixed wheels and one swivel wheel, the latter sometimes fixed to a steering handle. They are often used for light loads and where a high degree of manœuvrability is required. An important point which has to be watched in its design is the stability of the truck under operating conditions. There is a tendency for this type of truck to tip over if loaded unevenly or if a corner is taken too sharply.

Four-wheeled trucks: (*a*) *Castor steering*

Four-wheel trucks are as a rule designed for hand loading and unloading. They are made of wood and a variety of metals, dependent on the loads to be carried. These trucks are built with various wheel and castor arrangements, the commonest of which are: (*a*) four swivel castors which gives maximum manœuvrability in confined spaces, but are not suitable for long-distance travel as they are difficult to control and with heavy loads can become dangerous; (*b*) two stationary wheels and two swivel castors; this arrangement gives easy handling and better control. Pushing or pulling is by means of a handle from the swivel end; (*c*) two stationary wheels in the centre of the long side and of a slightly larger diameter than the two swivelling castors at the other ends. This arrangement raises the swivel wheels a short distance from the ground and provides good manœuvrability with reduced starting friction. Pushing or pulling can be from either end.

These trucks are made in a variety of capacities, but rarely beyond about 2 tons as this is the maximum one man can push on a good floor. Such trucks have numerous applications in warehouses, stores and factories, and the form of the superstructure varies according to the large variety of loads which they can handle, some being provided with special racks or holding devices for carrying specific objects. They are best suited for short-distance travelling on good floors.

(*b*) *Turntable steering*

These types of truck are usually called trailers and are for long-distance haulage by means of a suitable power unit. They are made in a great variety of sizes to suit particular requirements and their weight-carrying capacity can be up to several tons. While the majority are flat topped, superstructures for special purposes can be obtained such as for transporting steel bar, angle iron, timber, etc., or they can be provided with sides and a roof where weather protection is needed.

The most usual type of wheel arrangement is to have two fixed wheels and two wheels mounted on a swivelling turntable. To the turntable is fitted a draw bar and at the opposite end is a coupling hook so that a train can be built up. The swivel wheels should always be in the forward direction of travel when this wheel arrangement will be found to give perfect 'following' of the trucks along the path of the towing power unit.

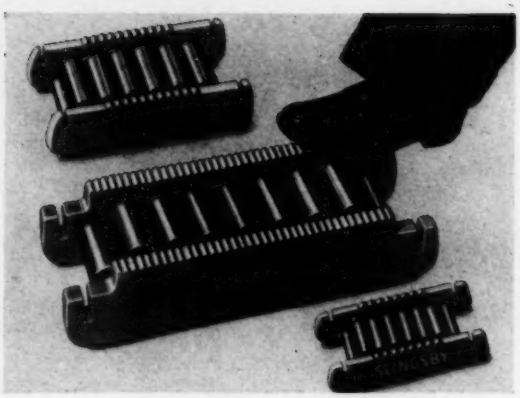

19 20

Fig. 19. *Powell hand-propelled lifting truck with manually operated lifting pump*

Fig. 20. *Hand-propelled lifting truck with battery-operated lifting pump, capacity* 15 *cwt, Salisbury Precision Eng., Ltd.*

Fig. 21. *Salisbury hand-propelled lifting truck with manually operated lifting pump, capacity* 7 *cwt. Fitted with large-diameter pneumatic tyres for use on uneven or rough ground*

They have many uses in large factories where goods have to be taken from one building to another and for hauling many types of goods at railway termini and docks. It is the modern practice to load flat trailers with palletized goods and it has been calculated that there is a minimum economic distance for the use of such a tractor-trailer system. It is contended by some authorities that a fork lift truck is designed primarily for stacking work and not as a prime mover for traction purposes, traction work being performed more economically by a less expensive tractor, either electric, diesel or petrol. However, before embarking on such a project the following considerations should be borne in mind as theory must sometimes give way to what is operational practicability. If for instance a tractor-trailer system is installed to operate between several points carrying palletized loads then unless a fork lift truck is available at the terminus, the tractor driver tractor, and trailers are all idle until unloading can take



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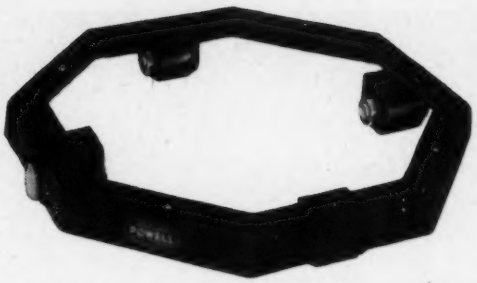

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Fig. 22. Powell low-loading four-wheeled bogie, capacity 4,500 lb, weight 38 lb

Fig. 23. Machine-moving bogies with endless tracks, capacity up to 25 tons, Slingsby, Ltd.

Fig. 24. Special truck for carrying loads up and down flights of stairs with ease and safety, Salisbury Precision Eng., Ltd.

place, similarly when loading again. It would require a very large quantity of material to be moved continuously to justify an organization on the basis of a tractor-trailer system and a fork lift truck at its disposal at both ends of the journey. In most factories where the travelling distance from one extreme to the other is not excessive and where such a system is contemplated, consideration should be given to making the trailer system independent by using a fork lift truck for traction purposes as well as loading and unloading the trailers. In this manner full utilization of labour and equipment can be achieved. At periods when there might be no work for the trailers the fork lift truck and its driver can be employed on other duties.

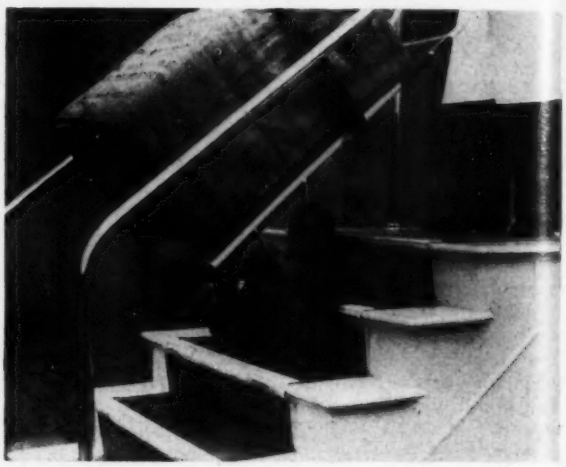

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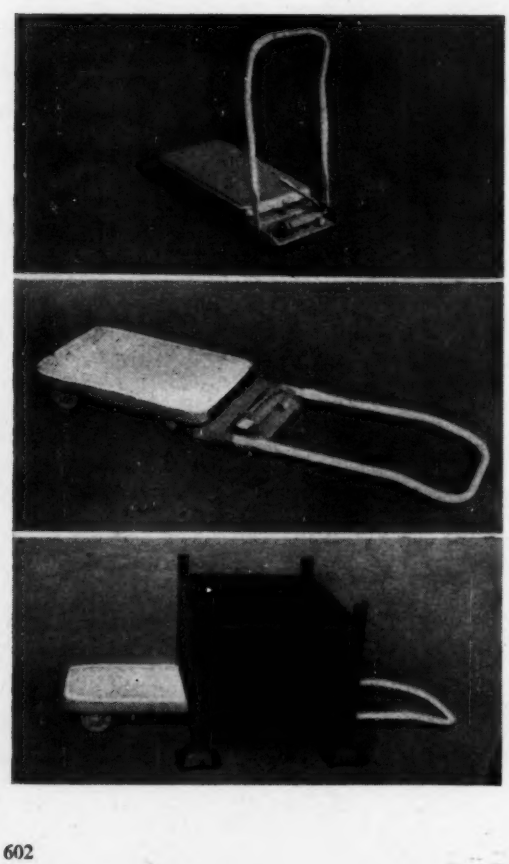
Fig. 25. Special truck to facilitate loading and unloading pallets from vehicles by Eccles (B'ham), Ltd.



Lift Trucks, Platform Type

These trucks are normally provided with four wheels, two fixed at one end of a metal framework while the remaining two are placed close together and are connected to a steering handle. By a pumping action of this handle an open framework or solid platform is raised a sufficient distance to raise a platform or stillage a few inches from the ground. The lifting power in some cases is by means of a mechanical leverage system and in others by an hydraulic jack. By depressing a foot pedal the platform or stillage can be lowered again to floor level. Usually this return action is controlled by an hydraulic damper so that this takes place smoothly and without a sudden shock. Lifting capacities do not as a rule exceed 2 tons. These trucks are for use on good floors and for short-distance work movement, because of necessity they are fitted with small-diameter wheels. Platforms or stillages should always be used with this type of truck so that handling is reduced to a minimum, the load being kept off the floor so that it does not have to be picked up and placed on the truck and then taken off again at its destination.

Another type has a much higher lift and these are used for handling press tools, jigs or fixtures in a store or at the machine tool. They are also used for handling awkward or heavy components in and out of machines or for stacking small cases, bags and sacks. They are only suitable for movement over short distances owing to their inherent weight. Lifting can be by means of a hand-operated hydraulic pump or by a motor-driven pump, in which case

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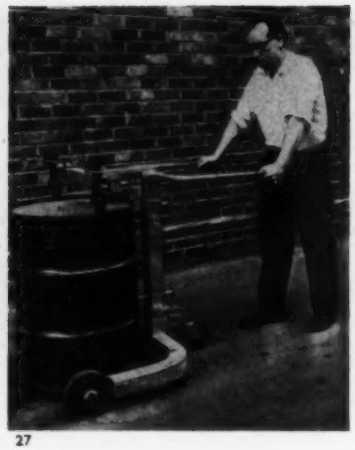

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Fig. 26. Special drum truck picking up a 40-gal oil drum, Conveyancer Fork Trucks, Ltd.

Fig. 27. Conveyancer special drumtruck transporting a 40-gal oil drum

connection must be made to a source of electricity.

Lift Trucks, Pallet Type

The hand pallet lift truck is very similar to the previous category described, except that the load carrying part consists of two narrow platforms similar to forks. These are so designed that they can enter under a pallet or between the top and bottom decks of a flat slatted pallet. The distance between the forks must be such that they will enter the pallet without fouling any centre supports between the decks. The steering handle at one end is connected to one or two closely positioned steering wheels. Again by a pumping action of the handle the load is raised a few inches off the ground either by an hydraulic lifting jack or by means of a mechanical leverage system. Lowering is controlled by an hydraulic damper so that sudden shocks are avoided. Situated near the tip of each fork are roller-type wheels which can be connected by a linkage system to the lifting mechanism. The lifting and lowering of the load is actually achieved by depressing these wheels or allowing them to retract inside the forks.

It is very important to ensure that the position of the wheels is such that they will fit into the appropriate gap between the slats of the bottom deck of the pallets with which they are to be used as there are many types of pallets and trucks available.

Before purchasing either trucks or pallets it would be advisable to consult British Standards Institution's publication B.S. 2629 : 1955 which deals thoroughly with this vital aspect of the use of hand pallet trucks.

Load carrying capacities of up to 2 tons are usual, but because of the fact that only small-diameter wheels can be fitted to this type of equipment its use is thereby restricted to short distances over very good surfaces only.

Very small lead-in wheels are fitted in the extreme tip of the forks ahead of the main rollers to facilitate entry over the thickness of the pallet deck or slats.

As with the platform variety just described in the previous section, so also are there high-stacking models for handling palletized loads. They are made in several types, having a range of lifting capacities from a few hundredweights up to 15 cwt. Lifting heights also vary and according to these various requirements they are supplied with either a hand-operated hydraulic lifting pump or are fitted with a battery, or alternatively they can be operated by connecting to a mains supply source of electricity. These trucks being manually propelled require good floors to work on although there is one type fitted with large-diameter pneumatic tyres for use over rough or uneven surfaces.

Dollies or Bogies

The purpose of a dollie or bogie truck is to provide a means of moving over short distances very large or very heavy objects such as packing cases or machine tools. They are particularly useful where there is no lifting tackle or there is no ready access for other types of lifting and moving equipment. A dollie or bogie is usually a small, light but very strong steel framework fitted with a number of small-diameter swivelling wheels or rollers. Their low construction makes it unnecessary to raise the heavy object to be moved more than a few inches off the ground. This is usually accomplished by making use of levers or jacks.

Heavy assemblies can also conveniently be built directly on to these moving devices. When the work is completed it is then a relatively simple job to move the assembly to an inspection bay or packing shop without further lifting. They can be obtained with a load carrying capacity of up to 25 tons, or 100 tons where four are used—one at each corner of the object to be moved. With the endless roller chain type, detachable turntables and steering handles can be obtained. The endless track of rollers also makes it easier to overcome small breaks in the floor surface.

Special Purpose Trucks

Only a few examples can be given of trucks which have been designed to meet a special need and to overcome a specific problem. They are numerous and new types are consistently being developed by truck manufacturers, but many are designed, built and used by individual companies and are often never publicized. In so many industries the truck is the sole means of moving materials and their design and purpose are legion and are limited only by the ingenuity of the design engineer.

Stair Climber

This is an ingenious adaptation of the conventional sack-truck and is designed for the safe transportation of goods up or down stairways in blocks of flats or offices and in hotels. It is particularly suitable for handling fragile items such as television and radio receivers or other domestic appliances.

On either end of the axle a single large wheel is replaced by a 'spider mechanism' which is a cross-shaped wheel carrier. At each of the four ends of the cross is a medium-sized wheel. This device mounts each tread and riser of the stairway in such a manner that the axle moves in a straight line and the load consequently is not subjected to a jolt on each subsequent step. An average person can transport a load of 1½ cwt single handed upstairs and even greater loads dowstairs. This truck can be made to fold for easy storage and other models can be made to suit individual requirements.

A ratchet safety device is incorporated in the 'spider mechanism' ensuring that when ascending the 'spider' can only revolve in one direction. This permits the operator to pause at any level without any fear of the truck running away. The ratchet is disengaged when descending and an automatic brake comes into operation. A cranked handle gives the operator a convenient position even when on the stairs above the truck.

Flattie Truck

This truck has been specially designed to facilitate the loading and unloading of road vehicles, and particularly covered ones with pallets or stillages. The platform of the truck is only 18 in wide and its special feature is the fact that its hydraulic lifting pump and towing handle can be folded down so that they do not project above the platform of the truck itself. This enables the truck to be pushed

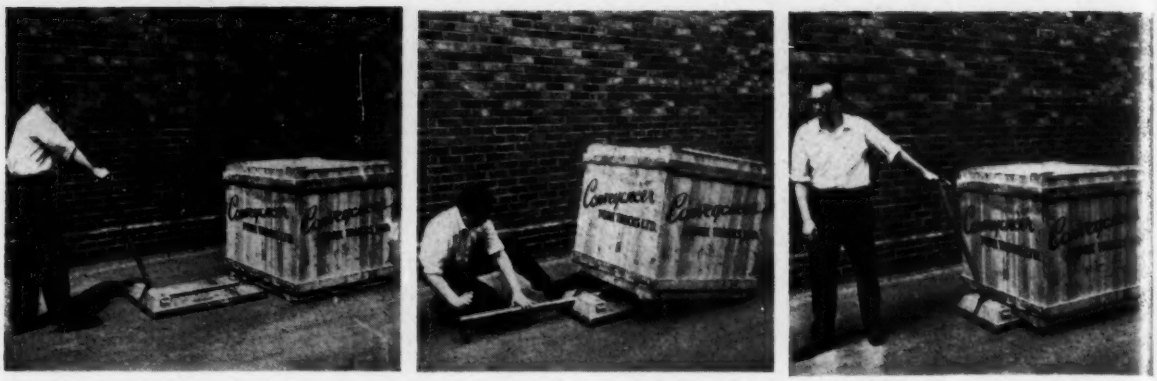

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Fig. 28. Conveyancer skidtruck: (a) approaching load to be transported; (b) load raised and skidtruck being pushed under the load; (c) load in position and being transported on the skidtruck

under a pallet or stillage and to be pulled out on the opposite side and herein lies its particular application to this problem. Once a fork lift truck has removed the first two pallets out of the back of the vehicle an ordinary truck moving the next pallet to the tailboard will find that the truck itself is then in the way so that shunting and manœuvring has to take place. With this truck the handle is simply pulled down, the truck pushed under the pallet and withdrawn on the other side ready to tackle the next pallet in line. The reverse procedure also simplifies the unloading of a vehicle. If required to take the truck on the vehicle to assist in unloading at its destination, it can easily be accommodated underneath the stillages or pallets, thus occupying no additional area.

Special Drumtruck

This truck is a manually propelled three wheeler, but is rather different from the usual types of three-wheel trucks so it was considered that it should be inserted in this section. With this truck one man can lift an open or closed oil or chemical drum. As the method of transporting the drum retains it in a stable vertical position there is no danger of the liquid contents of an open drum being spilled.

The drumtruck is provided with two large wheels and a third castor wheel-making it easy to push and to manœuvre. The front wheels straddle the drum to be handled which is picked up by automatic grippers engaging the rim of the drum. The grippers can be disengaged by one movement of each gripper handle. Adjustments to the truck are provided to enable drums and containers of various heights and diameter to be handled.

Skidtruck

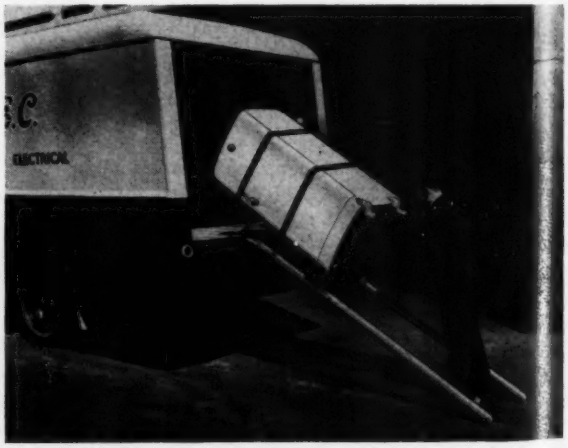
One man can raise and move with this truck packing cases up to 1,760 lb in weight without having to make use of battens, slings or any other device. The truck and method of operation are quite unique. In cases where the centre of gravity of the load exceeds that of the truck then two trucks can be used, one at either end of the packing case.

The method of working the truck is so different from any other that a detailed description is warranted in order to appreciate its possibilities. The illustrations in this instance are insufficient. The truck is placed about 5 in in front of the packing case to be lifted. The handle is turned through 90 deg and pushed through a slide to the front of the truck up against the load. Holding the truck in position by placing one foot on the base, a steel tongue at the bottom end of the handle is pushed under the case. The handle is then pushed to the floor and will lie in the groove through which it was pushed to the front of the truck. This movement will have levered the case up slightly off the floor and will allow the body of the truck to be pushed with the foot, under the packing case. The handle is now free and can be raised which will lower the case on to the truck. Rotate the handle back again through 90 deg and lock it in its original position when the load and truck will be ready for transportation. To remove the case from the truck only a quick jerk is necessary towards the operator when the case will slide forward from the truck.

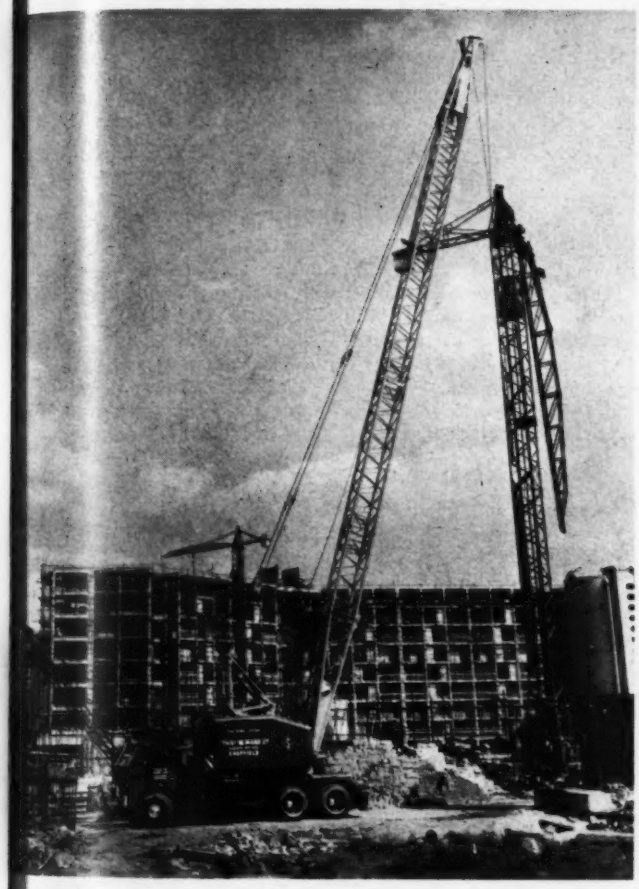
Appliance Truck

This appliance truck has been designed to facilitate the handling up and down stairs and the loading into a vehicle of such delicate items as television receivers, radiograms, washing machines and refrigerators. It is light in construction weighing about 28 lb. A quick tensioning webbing strapping device is provided which secures the load securely against a full length close-density foam-rubber apron. This affords complete protection of the delicate finish of the load. Rubber-tyred wheels ensure smooth and silent transit and reduce the possibility of jarring. A delivery vehicle can be equipped with a light runway, up and down which the truck can be pushed or lowered by hand. To assist in negotiating stairs a safety harness can be provided with lifting handles which when used by the man in the lower position and attached to the bottom of the truck make this operation safe and considerably easier.

Fig. 29. Slingsby appliance truck carrying an unwrapped refrigerator being pushed safely up a light runway on to a vehicle



SMITHS ANNOUNCE NEW 22½ TON TRUCK CRANE



THE MOST RECENT addition to the truck-mounted range of machines made by Thomas Smith & Sons (Rodley), Ltd., Rodley, Leeds, is the M.E.I. Truck Crane which has been introduced to meet the U.S.A. 25-ton (56,000 lb) lifting-capacity ratings. The maximum lifting capacity of this crane on British ratings is 22½ tons (50,000 lb) at 10-ft radius when working with the 30-ft basic boom and 4·7 tons at 25-ft radius with maximum length of main boom, i.e. 100 ft.

The truck on which this machine is mounted is a six-wheeled special 'Foden' unit with a heavy-duty chassis frame capable of carrying the enormous loads and twisting forces which are encountered by this type of vehicle. One outstanding feature of this machine is the overall width which has been kept to 8 ft in order to permit unrestricted travel on public highways in Great Britain.

The crane carrier incorporates outriggers with screw jacks which can be extended to 13-ft centres to provide adequate stability for heavy loads and high-lift work. Special attention has been paid to the design of the outriggers to eliminate deflection and this has resulted in a much steadier crane than earlier models.

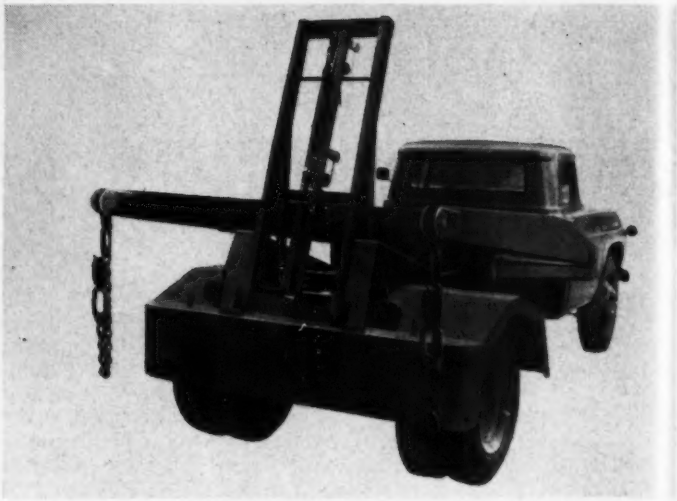
The crane carrier is powered by a 'Gardner' 5LW engine, developing 94 b.h.p. at 1,700 r.p.m. as standard. A 6LW 'Gardner' engine can be fitted if preferred. Transmission is by single-plate clutch and a five-speed gearbox, incorporating super low gear, and an eight-speed gearbox can be fitted if preferred. The brakes are air-pressure operated and the electrical system is 24 V for both starting and lighting. The rear bogie of the chassis is mounted on substantial rocking beams with a third rocking beam to compensate for individual axle movement. Both axles of the rear bogie are driven. The road wheels are fitted with Michelin D.20 metallic-corded 'Y' type tyres which provide the strength for the tyres necessary for free-on-tyres crane working. The cab is designed with a central trough to allow the crane boom to be carried in a forward position for travelling.

The revolving superstructure is fitted with the winch mechanism control gear and power unit and rotates on a large diameter live ring with 20 rollers, the tilting forces on the turret being taken by three fully adjustable hook rollers. The power unit is a 5 LW 'Gardner' engine, developing 75 b.h.p. at 1,500 r.p.m. The winch machinery and controls are fully mechanical, separate clutches and brakes being provided for each motion. The crane is of the modern style having a low-built cover for all machinery and a compartment for the driver giving 360 deg of vision. The windows are arranged to fold back into the roof in order to provide adequate ventilation when required. Access to the machinery is provided by removable panels. The structure frame is arranged to fold down to provide low head-room for travelling and yet to be sufficiently high in the working position to enable the 100 ft main boom to be lifted from the horizontal without assistance.

The crane boom, as already stated, has a basic length of 30 ft and is in two sections having pin-type joints; 10-ft and 20-ft pin-jointed lengthening sections are available up to a maximum length of 100 ft. The boom-head is of semi-hammer-head construction which simplifies the multi-strand rope reeving, and also considerably improves the clearance between the boom and the load especially at minimum radius as compared with an orthodox boom-head design. The boom suspension ropes are reeved on to a bridle which permits lengthening sections to be added to the boom suspension rope at the same time as lengthening sections are added to the boom. This arrangement greatly simplifies the rigging of the crane with the various boom lengths available. In addition to the 100-ft boom there is available a tubular-constructed Fly Jib, the basic length being 20 ft jointed in the centre for insertion of lengthening sections. Special attention has been paid to speed of preparation for work on site and the crane boom is fitted with devices to speed upboom-length changing.

Additional equipment is available to convert the machine for duty as a two-line grabbing crane, piledriver, face shovel, back-hoe and dragline. Capacity of the digging attachments is 3–4 yd.[3]

Fig. 1. Dempster-Dumpster type LFW Model 253-C



THE DEMPSTER-DUMPSTER SYSTEM

ALTHOUGH the Dempster-Dumpster range of container-handling equipment has been used extensively in the U.S.A. for some time, it has not so far found its way into the United Kingdom. With the announcement however by Bowell Duffryn Engineering Co., Ltd., that they have become licensed manufacturers for the United Kingdom and through their agents for all overseas countries except the Americas, it would seem that it will not be very long before we shall become familiar with this ingenious system.

There are five main types of vehicle within the range which it is claimed makes available to all types of industry and local authorities the means of economical bulk collection, transportation, setting down or dumping of products, bi-products, processed waste and refuse alike, controlled and operated only by the driver of the vehicle. The five types are designated LFW, GRD304-F-2, Dumpmaster, Dinosaur and Compaction Trailer.

The LFW type can be mounted on any standard truck chassis, it is of comparatively simple design and is used in conjunction with containers of various type from one cubic yard to 15 cubic yards capacity, and of 6,000 lb to 50,000 lb net load. The equipment is mounted at the rear of the truck and in operation the driver backs up to the container dismounts and attaches the boom arm chains to lifting pins on each side of the container. From hydraulic controls in the cab the driver raises the boom and lifts the container up the skid frame. When the sloping container rest is cleared a horizontal cylinder moves the skid frame forward and brings the container into its carrying position. Booms are then lowered and exert a positive locking action on the containers boom rest angle brackets. This holds the container securely in place during travel. At the dumping point the driver operates the cylinder so that it pushes the skid frame and container backwards. When lowered down the skid frame, the container bail engages the automatic dumping hook. This holds the container stationary at a fixed height, so that when the boom arms are lowered gravity causes the hinged bottom to swing down and discharge loads. In the instance of tilt-type containers, lowering the boom causes the container to rotate backward and discharge its load. After dumping the container is raised, disengaged from the dumping hook and moved to its carrying position for the return trip.

Fig. 2. Dempster-Dumpster type LFW model 253 dumping a 3 cu. yd. drop-bottom container

The GRD304-F-2 type will handle any of the same size and capacity containers but unlike the LFW equipment it will lift to a dumping height of 10 ft clearance maximum a net load of 9,000 lb, and is suitable for discharge into lorry railwagon, compaction trailer or Dempster Dinosaur etc. No chain slings are employed on this vehicle and to pick up a container the driver moves the three-stage telescopic mast to a vertical position, lowers the lifting forks to an elevation of a few inches below the position of the lifting pins on the sides of the container, and back towards the container. The flanged tips on the lifting forks help the driver to align them with the side of the container and its projections. A retaining notch below the lifting pin prevents the container from slipping off during pick-up, dumping or while in transit. When the container is in contact with the GRD the driver inclines the telescopic mast forward and raises the lifting forks which pull the container free of the ground. The driver continues raising the container up the telescopic skid frame with the lifting forks until the carrying position is reached. The same method of bail hook engagement is used to hold the containers while dumping, as on the LFW type.

The Dempster-Dumpmaster series have bodies of 18, 24 and 30 cubic yards capacity, with hydraulic ram compaction of 3:1 on medium-density materials and will self-load from containers of 1 cu. yd. up to 6 cu. yd., lifting net loads of up to 6,000 lb with its twin booms. There is an essential difference in this type to the previous two described, to the effect that the driver makes a frontal approach to the various-size containers, engaging the lifting booms in

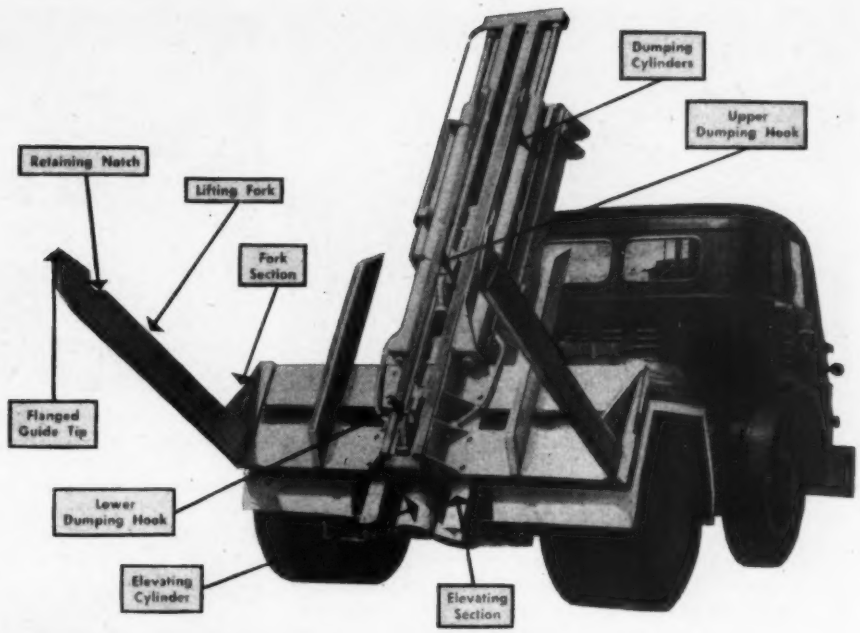


Fig. 3 (right). The GRD-304-F-2 with carriage tilted in container carrying position

Fig. 4 (below). GRD-304-F-2 with 6 cu. yd. universal container mounted for transit to dumping point

Fig. 5 (bottom left). GRD-304-F-2 with 6 cu. yd. universal container, elevated for high dumping

the container lift channels, and by the cab, hydraulic controls carries the loaded container over the cab and tips into the body aperture. An important point here is that the container is maintained in a vertical plane at all times when lifting and is only tipped when over the body aperture. The hydraulic ram plate within the body is then operated, compressing the materials to as little as one third of their original bulk against the tail doors. Discharge is effected by releasing the tail door locks and ejecting with the ram.

The essential difference in application between the LFW and GRD304-F-2 types and the Dempster Dumpmaster is that while the two previous types must make individual trips with single containers, the Dumpmaster empties a number of containers into its own body and, when full, proceeds to the place of discharge. With or without the loading booms this vehicle serves as a compaction bulker for hauls to distant tips.

The Dempster-Dinosaur is a further extension of the principle of detachable containers, but is capable of dealing

Fig. 6. 24 cu. yd. nominal capacity Dempster-Dumpmaster self-loading from a 4 cu. yd. castored container

Fig. 7. Compacted refuse ejected from Dempster-Dumpster

Fig. 9 (above). Dinosaur with its 24 cu. yd. body locked home for transit

Fig. 10 (below). Dinosaur picking up its 24 cu. yd. body

Fig. 11. Dinosaur putting its body off on its own built-in legs

with greater volumes and weights. It can pick up or set down by hydraulic action its own body of 10, 20, 30 or 40 cu. yd. capacity and 30,000 lb gross load. Pick-up of the body can be made from ground level or from a loading bay or wharf, and bodies can be fitted with legs so that they may be left standing free. They can be open or enclosed, low-sided, stake-sided or tank barrel within the gross weight requirements.

Mechanically the Dempster-Dinosaur is of simple design. Components are a tipping frame, two hydraulic raise and lower cylinders and a double-acting cylinder which moves a single loaded 'U' shaped bail forward and to the rear. The underside of the container is a rack whose centre contains a guide rail. In this guide rail are recessed lifting hooks spaced from front to back to coincide with the length of the bail cylinder stroke.

To pick up a container the tipping frame is raised, lowering the bail to the height of the hook stations. As the Dinosaur backs into the container the bail spring drives the bail into the first hook. The bail cylinder is then reversed which pulls the container rack up on to the tipping frame. The tipping frame is then lowered until it is parallel with the

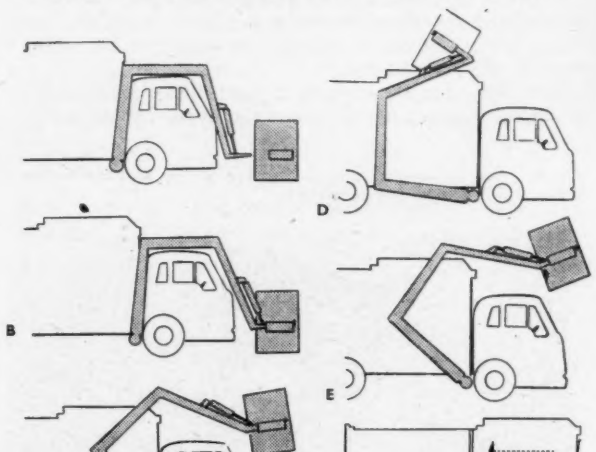


Fig. 8. Diagram showing operation of the Dumpmaster
A, approaching loaded container; B, lifting arms engage container; C, container is lifted over cab; D, contents are emptied into packer body; E, container is lowered to ground; F, material is packed on way to next container

container. The cylinder is again reversed and the bail travels back along the guide rail until it snaps into the second hook station. This ratcheting action is repeated from hook to hook and the frame is lowered and the container is locked into its carrying position.

To place the container on the ground on a loading bay or a rail wagon the action is reversed. Rather than pulling against the fronts of the hooks, the bail exerts a pushing action on their back surfaces. A swinging by-pass shuttle in the centre of the hook enables the operator to engage either the front or the back of the hook station.

Although it is a comparatively simple operation to load the container over the end of a flat rail wagon it has also been found possible to load the container from the side of the wagon. For this operation the container is pushed on to the car at an angle, the Dinosaur releases the hook and returns at a steeper angle to align and straighten the container using pressure from the bail.

(*continued on page* 609)

The Dempster Compaction Trailers are an extension of the Dumpmaster series, except that they are loaded by the GRD304-F-2 or from hoppers and are not self-loaded by integral arms. Also the compaction ram is powered by separate motor and pump unit mounted on the trailer. Two sizes of these trailers are available of 42 and 53 cu. yd. nominal capacity, which with compaction can hold up to approximately 160 and 210 cu. yd. of loose materials respectively. Designed for movement by standard fifth wheel tractors these trailers are intended for use on very large industrial plants and armed service bases where long hauls to disposal areas are expensive and timewasting, and for long-haul refuse contractors, etc.

The packing mechanism of the Compaction Trailer moves with a thrust of 65,000 lb. It is powered by a single telescopic cylinder on a support platform which moves out with the cylinder. This platform holds the cylinder straight to eliminate possible damage and prevent sagging. The packer head moves the complete length of the trailer body, the total length of the stroke being 25 ft 5 in. Ram diameters of the double-acting telescopic cylinder are 8, 7, 6, 5 and 4 in, the packing mechanism being operated by a hydraulic pump with a 50 gallon capacity at 1,000 r.p.m.

The rear door of the trailer is secured during packing and travelling operations by 3 powerful clamps mounted along the base seal. These clamps are released prior to dumping by a lever handle which folds down and out of the way when not in use. A neoprene gasket around the opening of the door prevents seepage from wet refuse.

Standing legs are provided for the trailer which are of tubular construction and telescopic for height adjustment. A simple lock-pin keeps the legs straight at all times and when the trailer is filled and ready to travel the operator simply removes the lock-pin and swings the legs up into the side plate section.

To facilitate the loading of materials a hinged door is fitted at the side of the hopper opening which can be opened to lower the loading height. This is easily handled from ground level by a spring-loaded bolt attached to a chain.

The five types of vehicles associated with the Dempster-Dumpster system are designed to facilitate the economic collection and movement of an infinite variety of materials.

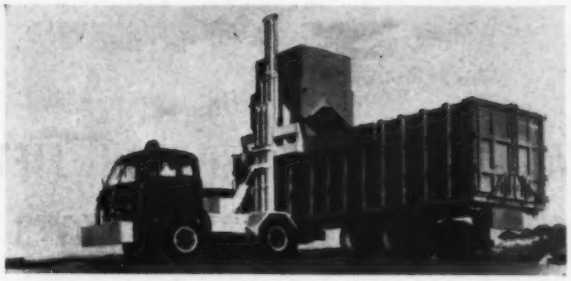


Fig. 12. *Compaction trailer model DB-42, being loaded by a type GRD-304-F-2*

All appliances are ruggedly constructed and operational movement is effected by shock-free hydraulic rams, pump driven by power take-off from the vehicle gearbox and controlled entirely by the driver from the cab. All equipment is mounted on standard commercial vehicles with the exception of the compaction trailers which are of mono-construction with integral power unit. Being mounted on standard commercial vehicle chassis, or, in the case of the compaction trailers, towed by a tractor unit, movement between points of loading and discharge can be made at normal permitted road speeds.

The successful installation of any Dempster system is assisted by a factual survey of the projected site or works. This survey being a part of the Dempster service so as to ensure that the best and most economical installation is put forward.

An interesting case history of an economic Dempster system installation has been quoted and can be taken as typical. It is that of a major works where one Dempster-Dumpster LFW 253/C model and 25 various-type containers serviced by the driver only, dispense with the permanent hire of 5 cu. yd. lorry and driver, two loaders and a mechanical shovel and driver. It is claimed in this instance that the Dempster installation was paid for by two years' saving on labour and hire alone.

FÉDÉRATION EUROPÉENNE DE LA MANUTENTION

SECTION II (Continuous Conveying) of the Fédération Européenne de la Manutention held meetings in Lucerne on the 21st, 22nd and 23rd September, 1959, on the occasion of the European Congress and there were present delegates from Austria, Belgium, Denmark, France, Finland, Great Britain, Germany and Saar, Holland, Spain, Sweden and Switzerland, U.S.A. (as observers). The proceedings were presided over by Mr. F. S. Stent, Babcock & Wilcox, Ltd., (Great Britain).

The Section has completed its work in respect of the First Edition of its International Terminology and 5,000 prints of the published version have been distributed. Considerable headway has also been made with regard to the Second Edition of the Terminology which will be in loose-leaf form and will be of a more detailed nature than its predecessor.

The Section is also engaged in the production of a European Classification and Symbolization of materials to be conveyed and the general consensus of opinion is that the document will prove to be of considerable importance to both the conveying industry and to users of Mechanical Handling equipment. It is considered desirable, therefore, that a classification of the kind envisaged should be published as soon as it is practicable to do so.

The Section has been studying the possibility of seeking a modification of the universal decimal classification, but it has been decided to ask the F.E.M. as a body to create a liaison with the Federation Internationale de Documentation at the Hague as the subject is likely to affect all Sections.

One of the main functions of the Section is the setting up of Standards at European level and co-operation between the F.E.M. and the International Standards Organization has been established. Common ground has been found with regard to standardization of certain aspects of troughed belt conveyors and other facets of this type of equipment are to be studied at a later date. A formula is also being sought for the standardization of certain components of gravity roller conveyors.

The Section is also continuing its examination of safety regulations operated in various countries in respect of specific items of equipment.

The following were elected to hold office until the next Annual General Meeting of the Section: *Chairman:* Mr. F. S. Stent (Great Britain); *Vice-Chairmen:* Mr. E. Borthen (Sweden); Mr. W. Hamann (Austria).

The next meetings of the Section will be held in Stockholm at the end of June, 1960.

A CONVEYOR-RAMP FOR LIFTING LOADS CARRIED ON HAND BARROWS OR TRUCKS*

by H. G. Vallings, A.M.I.Mech.E.

Fig. 1. *Loading packed bricks on to lorry*

Fig. 2. *Return of empty barrow*

A new type of machine, a conveyor-ramp, has been developed by the Building Research Station for conveying a loaded barrow to a higher level.
The machine and its method of operation are described.

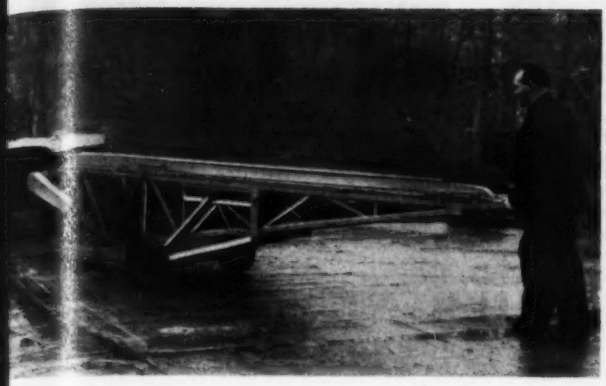
WHERE MATERIALS ARE commonly moved horizontally in hand barrows or trucks, they can be loaded on to lorries without difficulty where there is a loading bay or dock at the same height as the floor of the vehicle. In the course of an investigation by the Building Research Station into methods of handling packed bricks, it was found that at those brickworks which were not equipped with loading docks, some mechanical means was required for lifting the packs on to vehicles without removing the bricks from their special barrows.

To meet this need a conveyor-ramp, provisional patent-specification No. 11779/58, has been developed, in collaboration with a firm of conveyor specialists, T. & T. Works, Ltd., of Billesdon, Leicester, to raise a loaded barrow of a total weight of 5 cwt from ground level up to the deck of a lorry or a railway wagon (Figs. 1-5). Such a machine, which costs £200, might, however, find application in other industries, not only for loading vehicles but also for elevating loads normally carried in barrows, to a higher level or floor.

Description and method of use

The device consists of a ramp or walkway which is mounted on wheels so that it can readily be moved by one man, Fig. 4. A conveyor chain, driven by a 1½-h.p. petrol engine at a speed of 100 ft/min, runs in guides up the centre of the walkway. Fixed to the axle of the barrow to be used is a pawl, Fig. 3, which engages with the chain as the barrow is wheeled on to the lower end of the ramp. The chain pulls the loaded barrow up the ramp while the operator walks behind still taking the weight on the handles. When a small

Fig. 3. *Pawl mounted on axle of barrow*



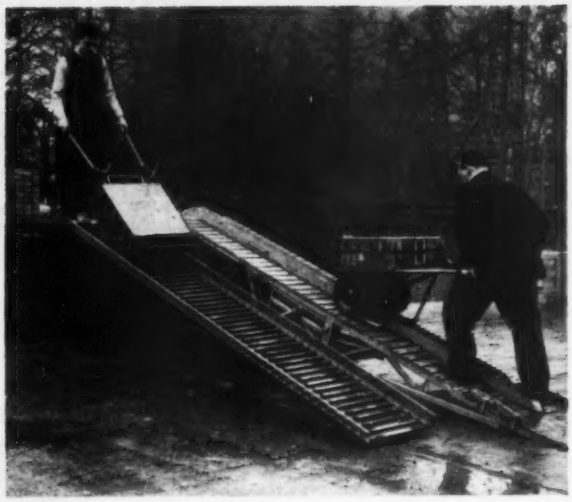


Fig. 4 (above). Wheeling conveyor-ramp into position
Fig. 5 (right). Additional ramp alongside conveyor-ramp used when two men are loading

horizontal platform is reached at the top of the ramp, the pawl is automatically disengaged and the operator pushes the barrow forward in the normal manner along the deck of the vehicle.

After placing the load the barrow can be wheeled freely down the ramp since the pawl is so designed that in this direction it does not engage with the chain.

Performance

During a trial at a brickworks it was found that with the aid of the conveyor-ramp, one man could load a lorry at the rate of 20 packs of bricks in 18 min—a rate of loading of about 9 tons/hr. The device thus provided an effective solution to the problem of taking loaded barrows up on to a vehicle where a loading dock was not available. Where a higher rate of loading is required, two men can be employed on this operation but to prevent them getting in each other's way, an additional ramp of simple construction may be necessary for the return journey as shown in Fig. 5.

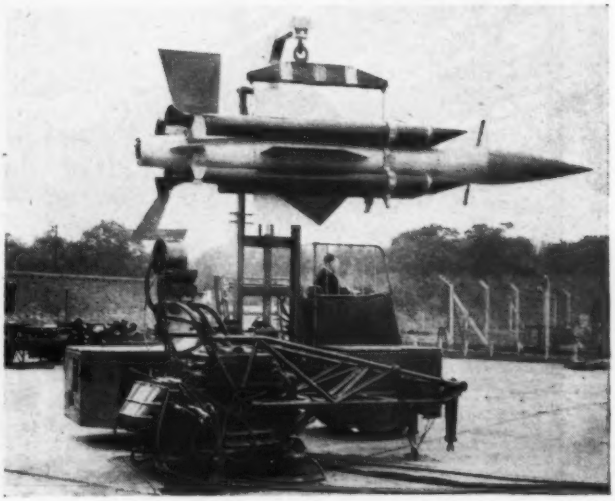
Acknowledgment

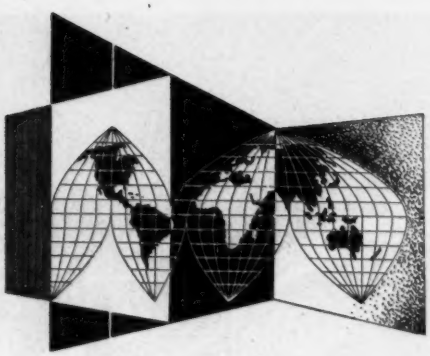
This paper describes work which forms part of the programme of research of the Building Research Board and appears by permission of the Director of Building Research.

HANDLING GROUND-TO-AIR GUIDED MISSILES

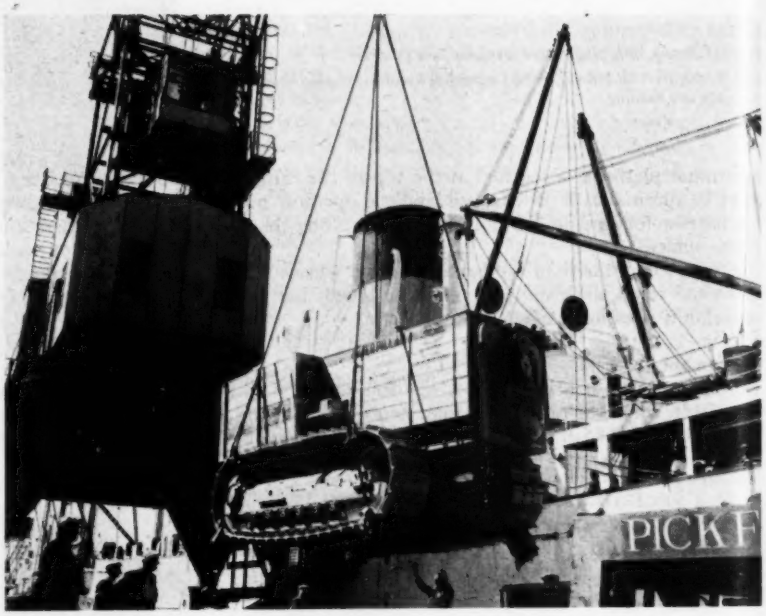
THE accompanying illustration (copyright of English Electric Co., Ltd.) shows a *Kestrel* side-operating fork lift carrier of 3 tons capacity lifting a *Thunderbird* ground-to-air guided missile on to the launching platform. At a recent demonstration the *Kestrel* carriers were to be seen loading, transporting and unloading the *Thunderbird* missiles in their cased and uncased forms. In cased form the missile is lifted on to the twin decks of the *Kestrel* by means of the hydraulically operated extendable and retractable forks, the cased missile then being unloaded by performing the operation in reverse. When uncased and fitted with warhead and fins as shown in the illustration the missile is similarly lifted on to the twin decks of the *Kestrel* by the hydraulically operated crane attachment which then replaces the forks.

After transportation to the launching site, during which the missile rests securely on chocks on the twin decks, the missile is lowered on to the launcher by the crane attachment which, like the forks, is hydraulically operated, vertically and laterally. *Kestrel* carriers are manufactured at Maidenhead, Berks, by Materials Handling Equipment (Great Britain), Ltd.



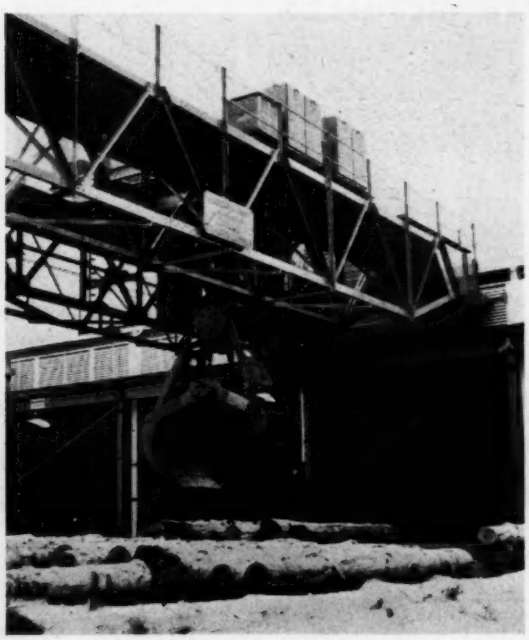


BRITISH MECHANICAL HANDLING EQUIPMENT OVERSEAS



BORNEO
One of eight Glasgow built Caterpillar Series H D8's being shipped at Glasgow for Balik Papan in Borneo where they will help roadbuilding and pipelaying for Shell Indonesia

NEW ZEALAND
Herbert Morris 10-ton electric overhead crane 80-ft span fitted with a special grapple for handling logs prior to pulping in a paper mill at Kawerau, New Zealand



Le matérial britannique de manutention mécanique se trouve en service dans la plupart des pays du monde. Chaque année, depuis la fin de la guerre, le chiffre des ventes à la clientèle des pays d'outremer s'est accru. Des acheteurs venus de tous les pays du monde accourent aux Expositions de la Manutention Mécanique (organisées par notre publication), qui ont lieu tous les deux ans à Londres, si haute est l'estime que l'on a pour le matériel de fabrication anglaise.

Dans cet article, à suivre tous le mois, nous vous présenterons des détails succincts et des illustrations du matériel anglais spécialement étudié pour et mis en service dans les pays étrangers.

Nous invitons cordialement les lecteurs de l'étranger à écrire à notre Rédacteur en Chef (The Editor) pous tous renseigements concernant un type quelconque de matériel anglais de manutention mécanique, ou les noms de fabricants, agents distributeurs ou représentants dans un pays donné.

British mechanical handling equipment is to be found working in most countries of the world. Each year since the end of the war, sales to overseas customers have increased. Buyers from overseas flock to the Mechanical Handling Exhibitions (organized by this journal) held every two years in London, so great is the regard for British-made equipment.

In this feature, to be continued each month, we shall bring you brief details and illustrations of such British equipment designed for, or at work in, countries abroad.

Overseas readers requiring information on any type of British mechanical handling equipment, or names of manufacturers' agents or representatives in a particular country, are invited to write to the Editor.

BRITISH MECHANICAL HANDLING EQUIPMENT OVERSEAS—*contd.*

En la mayoría de os países del mundo puede hallarse funcionando equipo británico de manejo mecánico. Desde que terminó la guerra la venta de tal equipo a los compradores de ultramar ha venido aumentando sin cesar. Tan considerable es la estima en que se el equipo de fabricacion britanica en todo el mundo, que son numerosísimos los compradores extranjeros que se personan en Londres para visitar la Exposición de Manejo Mecánico (organizada por esta Revista) que se celebra cada dos años.

En esta sección, que aparecará todos los meses, les ofreceremos ligeros detalle- e illustraciones de tal equipo británico diseñado para países extranjeros o funcionando en ellos.

Los lectores de ultramar que requiran información sobre cualquier equipo británico de manejo mecánico, o el nombre del agente o representante de los fabricantes en cualquier país en particular pueden escribir pidiéndola al Director de esta Revista.

Britische Förder- und Hebegeräte befinden sich in den meisten Ländern der Erde im Einsatz. Seit Kriegsende steigern sich die Verkaufsziffern an ausländische Abnehmer von Jahr zu Jahr. Ein so grosses Ansehen geniessen Geräte britischer Herstellung, dass ausländische Käufer anlässlich der alle zwei Jahre von dieser Zeitschrift in London veranstalteten förder- und hebetechnischen Ausstellungen in Strömen herbeikommen.

In dieser monatlich fortgesetzten Artikelserie werden wir kurzgefasste Einzelheiten und Abbildungen britischer Geräte bringen, welche für das Ausland konstruiert bzw. dort bereits im Einsatz sind.

Ausländische Leser, welche an Auskünften über britische Förder- und Hebegeräte gleichwelcher Art, bzw. an Namen und Adressen der entsprechenden Hersteller, Agenten und Vertreter in irgend cinem gegebenen Lande interessiert sind, werden gebeten, sich schriftlich an die Redaktion zu wenden.

YUGOSLAVIA AND GREECE

Despite keen competition from overseas E. Boydell & Co., Ltd., Old Trafford, Manchester, have been asked to supply fleets of Muir-Hill 14B 1½-cu. yd. hydraulic dumpers to leading public works contractors in both Yugoslavia and Greece. This machine is also the subject of an important repeat order placed by one of Britain's largest contracting organizations

In Yugoslavia the dumpers will be engaged on disposal work from tunnellings in connection with a Government hydro-electric scheme. For this reason, each machine is fitted with a quarry-type body and a water-quenched exhaust system. They will be engaged on similar duties in Greece.

Designed for exacting dumper operation, the 14B combines strength with flexibility and the hydraulic tipping body offers complete control of tipping speed from five seconds upwards. Other advantages of the machine include the powerful Perkins P.6 Mark III diesel engine, patented Muir-Hill two-way drive, grouped controls and a high degree of driver comfort.

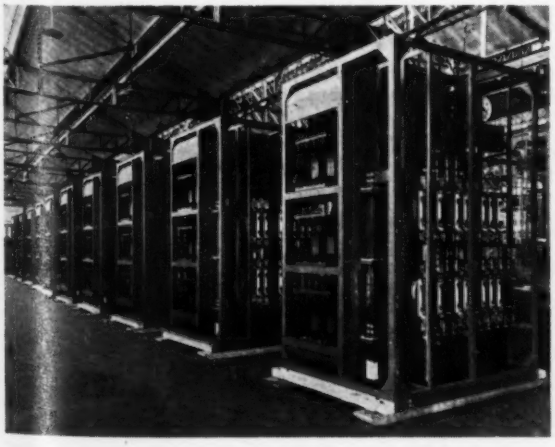
WEST GERMANY

A Coles Crane, model L2710, fitted with fly jib extension is seen hoisting into position the bell of a newly erected church in Essen, Germany. The crane is in service with Ferd Weismuller G.M.B.H. of Essen.

JAPAN

A thin coating of zinc provides an excellent protection against surface deterioration of steel sheets so that the final product, after pressing, folding, deep drawing or welding, presents a clean surface for painting. The zinc coating is best obtained by electroplating, and this principle has been widely employed in Britain. The trade name 'Zintec' applying to this product as made by the John Summers organization is well established, while a similar product is now produced in quantity by The Steel Company of Wales under the name of 'Mefco'. Other plants are in operation in Belgium and a plant has been commissioned in France, all of which employ Westinghouse rectifiers.

An order has been received through Electro-Chemical Engineering Co., Ltd., for Japan which will include Westinghouse water-cooled selenium rectifiers to provide the 60,000 amperes for this purpose, these will be similar to those shown in the illustration which are at the Paris factory of Westinghouse.



NEWS OF PERSONALITIES

A. Black
L. W. Bailey

L. W. Bailey & Partners, Ltd., Management and Industrial Consultants, announce that **N. E. Cornish** has been appointed a director of the company.

In addition to his experience as a consultant, Mr. Cornish has held executive appointments in both factory and general management and his training in production engineering was obtained in nationally known organizations. He is an associate member of the Institution of Production Engineers and of the British Institute of Management, and was recently elected a member of the Sales Managers' Association.

The British Materials Handling Division of the Yale & Towne Manufacturing Company announces the appointment of **John McIvor** as Scottish Area sales manager and of G. K. Frame as Scottish Area sales engineer. They will both operate from Yale & Towne's new sales and service department at East Kilbride, Lanarkshire. Telephone: East Kilbride 20241.

A. Black, sales director of Opperman Gears, Ltd., Newbury, has been appointed to the Board of LimiTorque Valve Controls, Ltd., an associate company recently formed to manufacture under licence from the U.S.A. the Limi-Torque range of valve operators.

After spending 27 years with Herbert Morris, Ltd., Loughborough, Mr. Black joined Opperman Gears, Ltd., in 1948 and was elected to the Board of that company in 1956.

The Prime Minister, the Rt. Hon. Harold Macmillan, on his arrival at Teleflex Products, Ltd., with (right) Sir Foster G. Robinson, Chairman, and Mr. E. Shetly, Sales Director

N. E. Cornish *G. E. Hart*

On his recent visit to Basildon New Town, the Prime **Minister, the Rt. Hon. Harold Macmillan,** toured the factory of Teleflex Products, Ltd. The Prime Minister showed keen interest in all departments and spent some time in the Mechanical Handling Division of the company, where in the experimental department the Teleflex overhead dual directional chain conveyor was demonstrated to him.

It will be recalled that rather more than a year ago **Sydney Walker** resigned his position as managing director of Laycock Engineering, Ltd., a Birfield Group Company, and was appointed as an executive director on the Board of the parent company, Birfield, Ltd. He still retains his active association with Laycock Engineering, Ltd., however, as he was made vice-chairman of that company. In the period following Mr. Sydney Walker's change of status, Kenneth Walker, formerly works director, and Eric Thompson, formerly commercial director, have been operating as joint general managers. They have now been appointed joint managing directors.

Chamberlain Industries, Ltd., of Staffa Works, Staffa Road, Leyton, London, E.10, manufacturers of tube bending machines and hydraulic equipment, reports the appointment of **G. E. Hart** as technical sales director of the company.

P. C. & C. K. Chase, Ltd., of Cobham, Surrey, announce that their Board of Directors has been reconstituted and is now as follows:—

Lady Patricia Lennox-Boyd (Chairman)
P. C. Chase (Managing Director)

and the other directors are **P. R. Chase, M.A., A.M.I.Mech.E., I. S. S. Ferris, A.C.A.,** and **B. A. Norfolk, A.C.A.**

November

The above issue will contain the following articles:

Handling with Industrial Trucks—Part 2

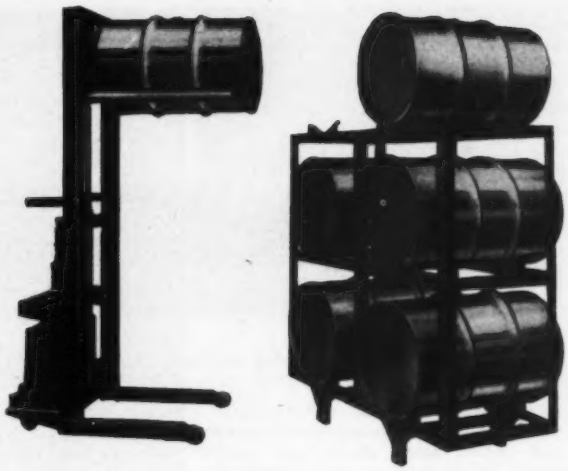
100 Per Cent Palletization—developments at a large brewery

Bulk Handling and Storage at a Biscuit Bakery

3-5 Ton Sideloader

and Regular Features

REVIEW OF NEW EQUIPMENT



The new Vertolifter hydraulic barrel stacker, a six-drum rack specially designed for use with it

HYDRAULIC BARREL STACKER

A new model has been added to the range of *Vertolifter* hydraulic elevator trucks by Powell & Co., Burry Port, Carms, South Wales. This is equipped with tubular forks and designed to lift drums weighing up to 700 lb directly off the ground to a height of 56 in or alternatively to 70 in. It is, therefore, useful for loading or unloading vehicles as well as for stacking.

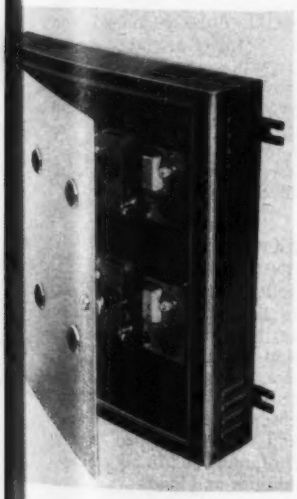
Like those of other *Vertolifter* trucks, the masts are of heavy steel channel construction, and all moving parts have ball or roller bearings. Power is provided by a 2-speed hand hydraulic pump, which alternatively can be driven by 3- or single-phase mains electric motor or by a 12-V motor and heavy-duty type traction battery. The truck is easily manœuvrable, having two wheels in front and two castors at the rear. It can be supplied with a detachable platform for use also as a normal lifting truck. Two sizes of barrel rack to hold either six or nine standard drums have also been designed for use with the stacker. These are so constructed that individual drums can be removed without disturbing the others.

CENTRALIZED LEVEL CONTROL

Fielden Electronics, Ltd., Wythenshawe, Manchester, announce a development of their well-known *Tektor* level controller that permits up to 150 ft of coaxial cable to be used between probe and unit, and multiple construction of the electronic units permits centralized or grouped indication of level.

A single *Tektor* consists of a probe connected to an electronic unit, the probe being installed on the container. The increase in interconnecting cable length means that the unit may be conveniently situated at ground level for ease of access or maintenance. If centralized level control is required, this extension of cable length allows all electronic units to be brought together from different parts of the plant and housed in one case. The interconnecting coaxial cable is supplied with the instrument and no other cables are required from probe to unit. Installation costs are, therefore, cut to a minimum with multiple construction because only one mains supply cable need be run to the multiple unit. With the Fielden capacitance system of level control, originated and patented by the company over 10 years ago, there are no electronics on the container.

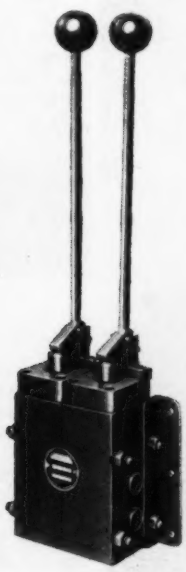
Six Fielden Tektor Minor electronic units built into one case for centralized or grouped indication of level



SENSED CONTROL OF HYDRAULIC PRESSURE

Designed for the hydraulic operation of heavy-duty clutch and brake mechanisms on cranes, winches and similar machines, the new Type 4879 Keelavite valve produced by Keelavite Hydraulics, Ltd., Allesley, Coventry, gives the operator a sense of feeling the hydraulic pressure so permitting a higher degree of control than is possible with conventional valves. Although the maximum pull required on the lever of the valve is only 18 lb, the full hydraulic pressure of 1,500 lb/sq. in. can be sensed and controlled. Increased movement of the control will give a corresponding increase in hydraulic pressure, providing progressive braking or declutching. The greater the hydraulic pressure applied to the actuators, the greater the resistance felt by the operator.

The valve is available to operate with an input pressure of not more than 1,500 lb/sq. in. There are three reduced pressures available: 0-500, 0-1,200 and 0-1,500 lb/sq. in. Port sizes are all ¾ in BSP. The valves can be supplied singly or in multiples of six. Usually they are supplied in pairs for combined brake and clutch operation. If required they can be adapted for foot operation.

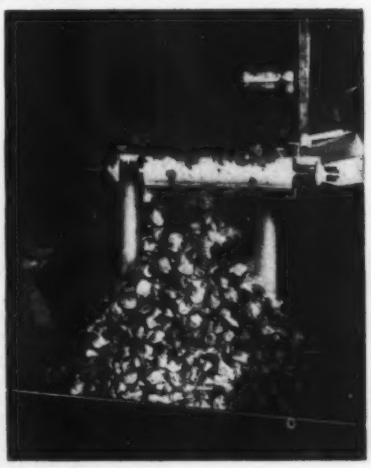


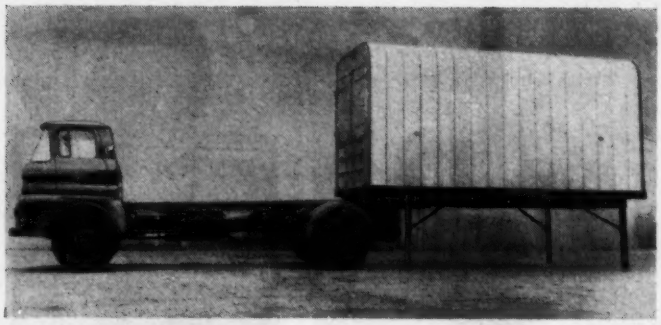
LEFT
The Keelavite type 4879 *valve for manual control of hydraulic clutch and brake mechanisms*

PLASTIC CONVEYOR BELTING

The Belting Division of BTR Industries, Ltd., Herga House, Vincent Square, London, S.W.1, have introduced a new addition to the standard range of BTR rubber and neoprene food belts. Known as the *Pluvicor*, this is a high-quality plastic conveyor belt designed for food handling and automation. It opens up new applications for conveyor belting as well as offering a replacement for belts made of less suitable materials. It is a p.v.c.-compounded belting, odourless, easy to

A BTR Pluvicor plastic conveyor belt handling potato crisps at the Rotherham factory of J. T. Food Products, Ltd.





A 7-ton Austin chassis equipped with the Abelson-Weeks system for handling detachable bodies

clean and highly resistant to oils, greases and certain acids, alkalis and neutral salts. It is particularly suitable for handling wet and sticky materials. The covers are smooth, non-porous and non-marking.

Pluvicor is extremely long-wearing and can be vulcanized endless or joined with mechanical fasteners. The temperature range is 10 to 140 deg F, and belts will withstand sterilization by steam. Stocks of 2-ply, 15-oz light fabric belting with $\frac{1}{32}$ in white p.v.c. top cover and friction surface back are available in widths of 2 to 24 in in increments of 2 in.

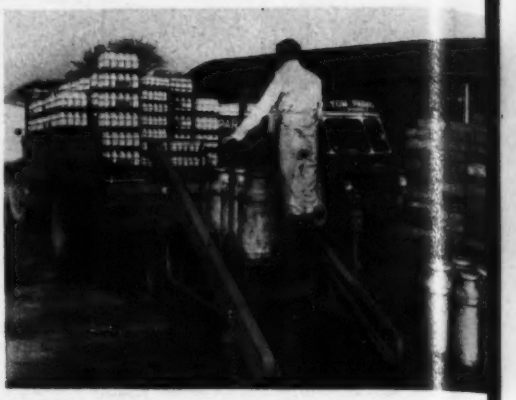
HANDLING DETACHABLE VEHICLE BODIES

Important savings in turn-round time of commercial vehicles and reduction of labour and operating costs are offered by the Abelson-Weeks system for handling detachable bodies of all types. Designed for 5- and 7-ton Austin chassis by Abelson & Co. (Engineers), Ltd., Coventry Road, Sheldon, Birmingham, 26, the equipment consists basically of an angle frame that supports the body and can be raised or lowered by a pair of hydraulic rams controlled by a valve in the cab, and held parallel with the chassis frame by radius arms mounted on tubular cross-members carried by sub-frames secured to the chassis by U-bolts. The detachable body is fitted with four permanently attached folding legs which can be easily stowed away in the side sills.

To dismount the body it is first raised by the rams, the legs are lowered and the body is then lowered until it is supported on the ground by the legs. When the body-supporting frame is further lowered the vehicle can be driven away. The reverse procedure is followed to load the body on the vehicle.

Two or more bodies can be handled with one vehicle, which can thus be kept fully employed with considerable saving in capital cost. The system is designed for one-man operation, eliminates the use of cranes or other lifting equipment, provides adjustment to differences in loading dock heights, affords a portable and flexible means of storing goods in bulk at low cost and minimizes double handling at loading bays. The Abelson-Weeks equipment also permits normal operation of a vehicle if desired.

A Star-hete heat-resistant conveyor belt in operation



When loading a vehicle with the Tamplin Auto-Mate loader the driver can travel on the loading platform

ELECTRIC LORRY LOADER

Originally designed for the dairy industry, the new Tamplin *Auto-Mate* loader enables a driver to load and unload his vehicle without requiring a mate. Fitted with a pair of 16 × 3-in cushion-tyred wheels at one end and rubber-tyred castors at the other, the extra strong welded tubular steel frame carries two inclined side channel members and guards of rust-proofed sheet metal. A lifting platform of fabricated steel plate, running on four ball-bearing rollers in the channels, has tubular steel safety side rails, and is raised from ground level by rust-proofed Renolds chains driven by an enclosed-type geared motor unit fitted with an automatic stopping brake and built-in safety-drive clutch. The motor is designed to take 3-phase, 400-440 V current.

The loader will lift a weight of 1,000 lb up to a height of 3 ft 2 in to 4 ft 4 in maximum in about 6 sec. Loaders for other heights can be supplied to order. Adjustable limit stops are fitted to control both the up and down travel of the platform, and at the top and bottom are raise, lower, and stop push-button controls. Overall dimensions are 9 ft 6 in long and 3 ft 10 in wide, and the lifting platform measures 2 ft 4 in wide and 3 ft long.

Manufacturers are N. Tampling & Co., Ltd., Birdham, Chichester, Sussex.

HEAT-RESISTANT CONVEYOR BELT

A new synthetic rubber conveyor belt, constructed to handle hot and abrasive materials, has been developed by the Belting Division of the Dunlop Rubber Co., Ltd., Speke, Liverpool. *Star-hete*, as it is named, has a cover of synthetic rubber which will withstand temperatures of up to 350 deg F, and can be supplied with a carcase weight of duck, and in ply ratings, to suit all conditions and loads.

TRADE NOTES

Course for Users of Induction Heating

Pye, Ltd., R.F. Heating Division of Cambridge, announce that they are holding a course for users and potential users of induction heating. The course commences at 2 p.m. on Tuesday, December 1st, and finishes at 6 p.m. on Wednesday, December 2nd. Full details can be obtained from Mrs. E. Raeburn, Pye Process Heating, 28 James Street, Cambridge.

Chairlift at Dudley Zoo

In our November, 1958 issue, we published an article describing the chairlift installed at Dudley Zoo by British Ropeway Engineering Co., Ltd. This plant successfully carried its 200,000th passenger during the week ending August 29th last.

Jack Olding & Co., Ltd.

The above company, of Hatfield, Herts., have been appointed exclusive distributors for the LeTourneau-Westinghouse Company of Peoria, Illinois. The current LeTourneau-Westinghouse production comprises a complete range of motorized scrapers, rubber-tyred industrial tractors and many ancillary equipments.

John G. Obstler

The above firm, of 83-57 118th Street, Kew Gardens 15, New York, U.S.A., intimates that it would like to represent a British manufacturer of hand pallet trucks and skid trucks in the United States.

I'M ALL RIGHT JACK—

Stanley Windrush (Ian Carmichael) tells Knowles (Victor Maddern) that he prefers to work on his own, as he starts work with a Lansing Bagnall fork lift truck in the scene from the film 'I'm All Right, Jack'.
'I'm All Right, Jack', a Charter Film production, directed by John Boulting and produced by Roy Boulting, stars Ian Carmichael, Peter Sellers and Terry-Thomas, co-starring Dennis Price with guest star appearances by Richard Attenborough and Margaret Rutherford. Released throughout the United Kingdom by British Lion Films Limited and Overseas by Lion International

Chaseside Loadmaster loading shovel fitted with two-way radio

E.M.B. Co., Ltd.

The above company announce that the new address of their Sheffield office will be 88 Brincliffe Edge Road, Sheffield, 11. Tel.: Sheffield 55278.

Armstrong Whitworth & Co. (Pneumatic Tools), Ltd.

The above company announce the opening of a new subsidiary in Germany, to be known as Thor Power Tool Co. Mr. Guenter Doehler is the manager.

Martonair form French Company

Martonair, Ltd., manufacturers of pneumatic equipment, announce the formation of a French company—Martonair S.A.R.L., under the management of Gerald Simon. The address of the company is 41bis. Bld. Paul Vaillant-Couturier, Montreuil (Seine). Tel.: AVRon 49-26.

Martonair S.A.R.L. will undertake the manufacture under licence of a large range of pneumatic equipment, and will work in close co-operation with Martonair companies in other Common Market countries.

'A Career in Production Engineering'

A new illustrated brochure, describing the opportunities available to boys entering the profession of production engineering, and entitled 'A Career in Production Engineering' has just been published by the Institution of Production Engineers.

This brochure will be of interest not only to school leavers and their parents, but also to technical colleges, training officers, youth employment officers and careers masters. Copies may be obtained, free of charge, from the Institution of Production Engineers, 10 Chesterfield Street, Mayfair, London, W.1.

Acme Conveyors, Ltd.

Acme Conveyors, Ltd., have now completed the transfer of their Detail Design, Buying and Accounts Department, to their office extension situated at 58/62 Seaward Street, Glasgow, S.1. This will result in better and more centralized co-ordination with the works at Hillington Industrial Estate, Glasgow, S.2.

The Technical Sales and Project Departments of Acme Conveyors, Ltd., continue to be administered from Acme Chambers, 1 Bradford Street, Walsall. Acme Ventilating, Ltd., continue to operate from Acme Chambers, 1 Bradford Street, Walsall.

Atom Chief Joins Lansing Bagnall

Board additions part of plan of progressive development, says governing director.

Reorganizations on the board of Lansing Bagnall, Ltd., include the addition as joint managing director of Mr. John Dolphin, C.B.E., T.D., D.L.C., F.Inst.F., at present engineer-in-chief of the Research Group of the U.K. Atomic Energy Authority.

The changes will take effect on December 1.

Announcing this recently, at the company's Basingstoke headquarters, Mr. Emanuel Kaye and Mr. John Sharp (who own the present private business) said: 'This enlargement of our board is part of the plan of progressive development which we have for Lansing Bagnall and its main subsidiary, J. E. Shay, Ltd. This plan has already taken the companies from a staff of seven in 1943 to its present payroll of 1,200 (plus those in the subsidiary companies in Switzerland and Canada). Now we are ready for the next phase.

'On the new board, we will remain joint governing directors. Mr. V. A. G. Lambert, C.B., C.B.E., M.I.Mech.E., who for two years has been on the Shay board, now becomes chairman and joint managing director of Lansing Bagnall, Ltd. Mr. Dolphin, as the other joint managing director, will have particular responsibilities on the engineering side of the business. Mr. Peter Boulton, who joined us six months ago as general manager now becomes a director in addition'.

Mr. John Dolphin, at present engineer-in-chief of the Research Group of the U.K. Atomic Energy Authority, who becomes joint managing director of Lansing Bagnall, Ltd., Basingstoke, on December 1st.

PUBLICATIONS RECEIVED

The Geon Story
British Geon, Ltd., of Devonshire House, Piccadilly, London, W.1, have produced a lavishly illustrated publication of 40 pages entitled 'The Geon Story'—Everyman's Guide to PVC Plastics.

Westinghouse Brake & Signal Co., Ltd.
The above company have produced two further colliery leaflets, C.P.2 and C.P.28, to be included in their colliery catalogue. Copies available from 82 York Way, King's Cross, London, N.1.

Rapid Magnetic Machines, Ltd.
A new publication dealing with 'Rapid' non-electric magnetic equipment has recently been issued by the above manufacturers of Lombard Street, Birmingham, 12.

Stuart Davis, Ltd.
The above company, of Bayton Works, Bayton Road, Exhall, near Coventry, have recently produced their latest price list of Red Ring air equipment, together with eight additional pages of new Red Ring air control valves. These catalogue pages are prepared for insertion into existing Red Ring air equipment catalogues and are available on request to the manufacturers.

Perkins News
The spring/summer 1959 edition of the above magazine gives details of the latest activities and developments of Perkins Engines, Ltd., Peterborough.

British Standards Yearbook
The 1959 edition of the British Standards Yearbook, complete to December 31st, 1958, is now available from the British Standards Institution, British Standards House, 2 Park Street, London, W.1.

George Angus & Co., Ltd.
The above company, of Angus House, 152-158 Westgate Road, Newcastle upon Tyne, 1, have produced a new catalogue which gives details, not previously publicized, of their range of oil suction and discharge hose qualities.

BISRA Annual Report
The 1958 edition of the British Iron and Steel Research Association's Annual Report, issued from 11 Park Lane, London, W.1, gives a selection of interesting projects in BISRA's current research.

Western Manufacturing (Reading), Ltd.
The above manufacturers, of The Aerodrome, Reading, have issued two booklets, one dealing with automatic weight and process control, and another describing the varied scope of their facilities at Reading.

Lancers Machinery, Ltd.
A leaflet describing their Sideloader has been produced by the above company of 41 Knightsbridge, London, S.W.1.

R. G. LeTourneau, Inc.
A two-colour bulletin containing photographs and information about the improved 30-ton capacity Electric Log Stacker, Series F, has been produced by R. G. LeTourneau, Inc., of Longview, Texas, U.S.A.

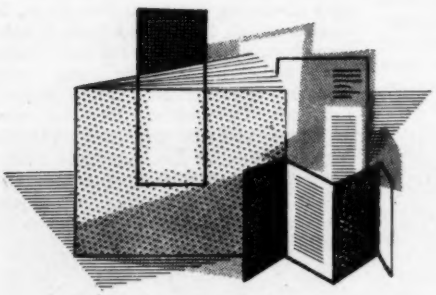
Scorer Refuse Destructors
A leaflet entitled as above has been issued by the Hodgkinson Group. Copies are available from Bennis Combustion, Ltd., Little Hulton, Walkden, Manchester.

George Angus & Co., Ltd.
A new leaflet has been issued by the above company, of Angus House, 152-158 Westgate Road, Newcastle upon Tyne, 1, entitled 'Gaflex Nylon Wefted Conveyor Belting'.

Manufacturers Equipment Co., Ltd.
These manufacturers, of Sutton Road, Hull, have produced an Information Sheet, No. 757/18, detailing their Rapistan 'LR' live roller conveyor.

Crypton News Bulletin
Crypton Equipment, Ltd., of Bridgwater, Somerset, have issued the above bulletin, together with their latest lists on battery chargers and portable testers. No. GC 259 contains full details of their complete battery-charging range and battery-testing equipment. List No. GC 159 embodies the Mini-Test range of portable testers.

Lang Pneumatic, Ltd.
These manufacturers, of Owen Road, Wolverhampton, have recently published a News Release, together with photographs, describing the improved version of their Pneulang solenoid valve, and three types of special cylinders.



ABSTRACTS AND REFERENCES

Articles on mechanical handling published in all technical and industrial journals of the world are indexed and abstracted below. Whenever it is known, the published price of the journal containing the article is given.

The addresses of the publications concerned are given and applications for copies of the journals mentioned should be made direct.

HANDLING MAINTENANCE MATERIALS
How You Can Hit the High Cost of Handling in Maintenance. By John D. Wray, *Factory*, 330 W. 42nd Street, New York 36, N.Y., U.S.A. Pp. 94-100. $1.

In exploring the many neglected opportunities that offer considerable reductions in maintenance costs, the author, as consultant in materials handling for the Engineering Service Division of E.I. du Pont de Nemours and Co., Old Hickory, Tennessee, combines advice on handling operations with work study. He points out that there are ten cardinal sins in materials handling. These relate to workers standing idle and waiting delivery of materials or tools, time spent in moving materials, yard labour, men carrying heavy loads, handling single pieces instead of palletized, banded or boxed loads, doling out materials from large to small returnable containers, damage to equipment or material for lack of proper handling facilities, accessibility of shops and storage areas, helpers being used mostly to fetch and carry materials and the possession of materials handling equipment instead of having to beg, borrow or steal it.

These aspects of the subject are analysed in considerable detail, and much valuable advice is given on how improvements towards greater efficiency at lower costs can be achieved. Reference is made to the many types of handling equipment available and typical examples of their applications. Before concluding, the author gives twenty-five tips on better handling of materials.

BOTH-SIDES PARTS INSPECTION
Automatic Conveyor Belt Inspection Machine. *Metalworking Production*, 95 Farringdon Street, London, E.C.4. September 18, 1959. P. 1455. 1s. 6d.

Particulars are given of a simple machine that utilizes two short belt conveyors to facilitate inspection of both sides of small flat parts. The conveyors extend on either side of the main structure, one at a higher level than the other. The parts to be

(*Continued on page* 619)

inspected are fed automatically from a hopper on to the upper conveyor on which one side is inspected by one of two operators. At the end of this belt they are transferred to second conveyor and at the same time are turned over so that their opposite sides can be inspected by the other operator. The machine is self-adjusting to accommodate different thicknesses of components.

SAVING LOADING TIME
Side-Tipping Loader. *New Zealand Engineering*, 18 Aurora Terrace, Wellington, C.1., New Zealand. July 15, 1959. P.243. 4s.

When loading road vehicles with a conventional forward-tipping loader during excavating and similar operations, much time may be occupied in manoeuvring the machine into the loading position, and in confined spaces the vehicle may have to be placed where it can only be loaded from the rear end. These drawbacks are avoided by the use of a Swedish invention that takes the form of a loader bucket that can be tilted to either side as well as forward. When fitted with this, a loader can be driven close up to either side or to the rear of a vehicle, whichever is most easily approachable, to discharge loads into the body. If the body is of large capacity and space permits, the loader can distribute its loads more evenly in it than is sometimes possible.

PREVENTING REVERSAL OF INCLINED CONVEYORS
Safety Device for Conveyors. *Metalworking Production*, 95 Farringdon Street, London, E.C.4. September 18, 1959. P. 1483. 1s. 6d.

A simple device for preventing the reversal of inclined conveyors when stopped, as may be caused by the effect of gravity on the load, is described. It consists of two pawls pivoted in diametrically opposite positions on one side of the flange coupling of the driving motor. The inner ends of the pawls are longer and heavier than the outer ends, so that while the conveyor is under power, centrifugal force maintains them in the retracted position. Immediately motion is stopped, however, the outer end of the pawl in the upper position is swung to project from the flange by the action of gravity on the inner end. Should the load then cause reverse motion of the conveyor this is arrested by the pawl striking a stop secured to the baseplate. Alternatively, the pawls may be mounted on either side of a reduction gearbox when this is separate.

REDUCING CONVEYOR SPILLAGE
Conveyor-Loading Feeder. *Mechanical Engineering*, 20th and Northampton Streets, Easton, Pa., U.S.A. September, 1959. P. 123. 50c.

A new conveyor-discharge trough feeder of the vibratory type, designed to reduce spillage of materials when feeding on to moving belt conveyors and to facilitate concentration of materials on to the centre of the conveyors to prevent loss, is announced. It is of the heavy-capacity type to feed at variable rates heavy, hard-to-handle bulk materials, such as chemicals, coal, rock, grains, and heavy constructional materials. Electro-magnetically produced vibration at 3,600 per minute is instantly variable to provide continuous, stepless feeding rate adjustments from 0 to 100 per cent capacity.

INCREASED PIPE LOADS FOR TRANSPORT
Inflatable Pipe. *Coal Age*, 330 West and 42nd. Street, New York 36 N.Y., U.S.A. September, 1959. P. 124. $1.

The ducting for heating a 7-room house could, it is stated, be conveyed in a box the size of an orange crate by using the thin-walled seamless metal tubing, known as Strubing, that can be handled in ribbon form and be inflated at the point of use. This new strip tubing will go into experimental production this year. Its inflatability not only makes it possible to transport it economically, but the cold rolling process used in making it provides an economical means of producing thin-walled tubing of materials in thicknesses either unavailable to-day or procurable only at prohibitive cost. For inflating, hydraulic, air and plain tap water pressures have been used.

PROPANE GAS-ENGINED STACKER
Stacker. *Food Manufacture*, Leonard Hill House, Eden Street, London, N.W.1., September 1, 1959. P. 361. 3s. 6d.

A new hand-propelled stacker operated by a propane gas engine is said to achieve complete combustion, thereby eliminating all obnoxious fumes and can thus be used indoors where ordinary combustion-engined machines are normally excluded. It has a lifting capacity of up to 7 cwt at a rate of 40 ft per minute and 5 ft and 7 ft lifting models are available.

Considerable saving in gas consumption has been obtained by linking the operating lever for the lifting movement to the engine throttle so that the latter is opened only during actual lifting operations. The engine ticks over during lowering and waiting. It is stated that the machine has lifted 60 tons in an hour at a cost for gas of about 8d.

ALL-ROUND STEERING TRUCK
Multi-Direction Lift. *Distribution Age*, Chestnut and 56th Streets, Philadelphia 39, Pa., U.S.A. August, 1959. P. 46. 75c.

A new fork lift truck that can be steered in any direction as may be required when handling materials and other loads of unusual shape is described. The steering and twin-drive motors are operated by one control lever which provides forward and reverse turns without use of the steering wheel which directs angle and side movements. The truck is more easily manoeuvred in tight aisles, around corners and for right-angle stacking. With overall length of 65 in, it can turn completely round within a 70-in circle. Odd-shaped and lengthy loads can be carried across the truck's forks and moved sideways down aisles or through narrow openings. Swing and reach are controlled individually or simultaneously by one lever.

RECENT PATENTS

The following are brief extracts of recent United Kingdom patents which we believe will interest our readers. For full details the original patent specifications should be consulted at, or bought (3s. 6d. each) from, The Patents Office, Southampton Buildings, Chancery Lane, London, W.C.2.

CABLE CARRIER
Danchert Krohn, of Oslo.—U.K. 813478.

Telfers or travelling crabs with reduced chance of wheels leaving rope, by having the wheels inclined to vertical and horizontal.

FORK TRUCK
Yale & Towne Co., of New York.— U.K. 813530.

Extending legs, mounted on small wheels, slide on forks in front of the truck for load positioning in narrow gangways with no danger of overturning.

SLING LIFT
S. H. Priestman & A. Cook, of Hull.—U.K. 813617/8.

Mechanical lift, with pulleys, two pivots a base and a jib with nylon cord and electric drive using a tubular sling frame and a plastic impregnated canvas sling, the whole being foldable and portable.

LIFT TRUCK
Heyster Co., of Portland, Oregon.—U.K. 813633.

Improved load elevator with good driver visibility, having compact upright and load carriage moving on outer uprights giving resistance to side stresses when elevated without extending mast upright.

BOTTLE CRATING
Mather & Platt, Ltd., of Manchester.—U.K. 813650.

Accurate grips avoid damage in handling sets of bottles with series of inflatable cylindrical sacks on the end of prongs to insert or remove a complete crateful at once.

TRENCHER
C. W. Howlett, of Oxfordshire.—U.K. 813694.

A tractor-operated trencher with pivoted boom, slewing arrangement which can be telescopic and sprags to give purchase into ground. Patent 747554 is mentioned.

ELEVATOR MAST
Atag Trust, of Liechtenstein.—U.K. 813753.

A design of temporary radio, TV mast up to 180 ft high on a wheeled base, with raisable platform inside the framework for elevating each section, using locking members and rollers.

FLUID PUMPING
Winget, Ltd.—U.K. 813903.

A design of pumps and pipes to move fluid concrete using a set of reciprocating cylinders.

CABLE GUIDE
Coal Industry Patents, Ltd.—U.K. 813982.

Belt cable guide with means to prevent cable disengagement on pulley whilst being reversed for return run.

LIFT TRUCK
West Deutsch Waggonfabriken A. G., of Köln.—U.K. 814054.

With hydrostatic transmission and made of simple interchangeable units.

DIP COATING
Don Ite Co., of St. Louis.—U.K. 814096.

Lacquer coat conveyor with quick withdrawal and continuous rotation of the pieces before hot drying so as to give no drip.

FLOOR CONVEYOR
Geo. W. King, Ltd., of Stevenage.—U.K. 814106.

Short or long paths are possible with reduced manual control using a 3 or more position set control device on the trucks.

ROTARY BRUSHES
Dendix Brushes, Ltd., of Chepstow.—U.K. 814113.

Road and airport speedy clearing of snow etc., using rotary brushes with a given mode of tuft suspension.

SHIPPING UNIT
American Cyanamid Co.—U.K. 814132.

Improvement on patent 786463 for multi-ply paper lifting skid—e.g. for fork trucks, to carry packs, e.g. of cement and chemicals, with the skid comprising tubes joined by paper.

FURNACE CONVEYOR
J. & A. Nassbueur, of Cologne.—U.K. 814147.

For wire and strip ring treatment in controlled atmosphere with a series of sealing curtains, some being removable if desired.

COAL DEDUSTING
E. Horrengt, of Belgium.—U.K. 814182.

Improvement on patent 690400 for dedusting coal even when moist and avoiding atmospheric pollution, by passing warm gas counter-current in drums with rotating shelves.

WAFER MAKING
Scribban-Kemp, Ltd.—U.K. 814208.

Auto wafer removal with rotation of holder to receive new charge of batter and edge trim using a suction device.

POWDER CHARGING
Akkumulatorenfabrik Dr. L. Jungfer.—U.K. 814216.

Hopper feed to give uniform layer on belt etc., with scraper edges defining a variable layer thickness.

FORK TRUCK
Yale & Towne Manufacturing Co.—U.K. 814224.

A hydraulic lift fork truck, of short length, using springs and piston action.

LAMP BULB MANUFACTURE
Sylvania Electric Products Inc., Mass.—U.K. 814224.

Defective lamp detector on production machine can memorize previous machine sources to detect if several faults rapidly occur from one given faulty plant. The photo-cell close to gas sealers, is water cooled. Patent 805896 is mentioned.

WRAPPING MACHINE
Ideal Wrapping Machine Co., of New York.—U.K. 814232.

Tape sealing of telescopic closed containers, using hoppers, elevators, ejectors etc., working at high speed with conveyors.

PAPER DRYING
J. W. Zanders G. m. b. H., of Rheinland.—U.K. 814233.

A permeable conveyor made of foam runs between plate presses for removing water from paperboard as it is made.

CARTON CLOSING
Dairy Supply Co., Park Royal.—U.K. 814241.

Waxed paper cream cups etc., sealed by metal sheet caps using machine outlined. Patent 689912 mentioned.

BOTTLE LABELLING
Rose Brothers Gainsborough, Ltd.—U.K. 814311.

Suggest bottle labelling with marginal adhesion, turning the label through 90 degrees with presentation via suction to bottles on conveyors.

TROLLEY
A. & H. Waldner, of Germany.—U.K. 814345.

A bottom support to small trucks etc., to prevent overturning when the wheels are oblique and on an incline—by use of bottom plates.

WRAPPER FEED
Rose Brothers Gainsborough, Ltd.—U.K. 814369.

Sweet etc., wrapping using a rotating pocketed wheel, somewhat as per patent 729223 which works at high speed with several parallel pockets being filled at a time.

CIGARETTE MAKING
Molins Machine Co., Ltd., of Deptford.—U.K. 814383/4/5/6.

Machines for inserting filter mouthpiece stubs and fixing with gummed uniting strips along with cutting, conveying, handling and deflecting devices.

WORK HANDLING
Seneca Falls Machinery Co., of New York.—U.K. 814422.

Lathe work auto feed and removal using conveyors driven by chains and moving synchronously. Patent 724815 is mentioned.

CRANE DRIVE
Provincial Engineering, Ltd., of Canada.—U.K. 814434.

Electric crane motors are totally enclosed to protect against dust, but to reduce inertia and size, cooling is provided using the bridge or trolley as external cooling surfaces.

BATTERY TROLLEY
E. Kaye et alia-Basingstoke.—U.K. 814451.

Fork lift truck for handling accumulators to and from fork trucks.

STEEL CONVEYORS
Untertage Maschinenbau G.m.b.H., Recklinhausen.—U.K. 814453.

An easy mode of attaching rollers and chain drive to the steel plates. Chain size can be varied.

SWEET HANDLING
Rose Brothers Gainsborough, Ltd.—U.K. 814470.

A sweet or small object pocketed-wheel wrapper, with faster input feed by auxiliary feed wheels. Patent 729223 is mentioned.

LUFFING JIB
H. Liebherr, of Württemberg.—U.K. 814504.

A building crane jib for slewing and luffing, aims to avoid bending stresses when luffing by a rope and tackle in the hoist line. Overluffing is prevented by a cable or spring.

LABELLER
Rose Brothers Gainsborough, Ltd.—U.K. 814529.

Bottle labeller using inclined conveyor feed to the cradle for suction label application, being rolled at the same time.

CIGARETTE WRAPPING
Molins Machine Co., of Deptford.—U.K. 814530.

A wrapper device for packs of cigarettes, comprising two pieces of silver paper, applied in a conveyor having folding stations in it.

MINE CUTTER LOADER
Gebr. Eickhoff Maschinenfabrik & Eisengiesserei m.b.H., of Bochum.—U.K. 814588.

Large coal is moved over the cutter base against an angled wall to the main conveyor, with little coal breakage.

MECHANICAL PAINTER
R. Dyer, of Chipping Capden.—U.K. 814591 2/3.

Greenhouse roof glazing bar painting machines described-operated from side, with valve control for paint intensity